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CONTENTS

III. LIVE STOCK AND BREEDING.

a) GENERAL

b) SPECIAL

IV. — Farm Engineering.

V. — Rural Economics.

VI. — Agricultural Industries.

PLANT DISEASES.

I. — Diseases not Due to Parasites and of Unknown Origin.

III. — Bacterial and Fungoid Diseases.

a) General

b) Special

V. — Insect Pests.

a) General

b) Special

The Editor's notes are marked (Ed.).

FIRST PART.

ORIGINAL ARTICLES

The Agricultural Meteorological Service in Germany

by

the late Dr. R. BÖRNSTEIN,

Professor at the Berlin Agricultural College.

The present meteorological service in Germany was instituted in 1906, previously several State and private institutions had done similar Thus the German Sea Observatory (Deutsche Seewarte) founded 76 in Hamburg had begun to issue weather forecasts for Germany, as attending to meteorological observations along the coast and to warnings. But after only a few years (1884) the weather forecasts discontinued. Then State Institutions undertook the publication of ier forecasts for the inhabitants of the country, namely in the Kingdom ony in 1878, in Bavaria and in Württemberg in 1881, in Baden in nd in Alsace-Lorraine, besides which there were private observatories lin, Magdeburg and elsewhere which had been started in accordance he wishes of the press. Plenty of experience collected both at home broad was thus available when the present service was organized.

The object aimed at was that the State service should in the first place l rapidly and cheaply the results of the observations made, leaving ceivers of such information, especially farmers, the task of drawing essary conclusions from them and forecasting for their own locality robable weather. By this means it is possible to utilize for wea- orecasts the great and valuable experience which practical farmers s, besides which the farmers are left more time to prepare their sts than the directors of the meteorological stations can dispose of, latter must telegraph their forecasts as early as 11 a. m., while the rs can continue for a few hours longer to observe the weather before ering the approaching changes.

The complete execution of this plan would entail the total abolition of l forecasts and the limitation of the service to the simple dstribution weather charts. But in order to render this feasible the great mass mers ought to possess the necessary knowledge for the comprehension

of the weather charts, without which all weather forecasting is impossib
As for the moment such knowledge cannot be reckoned upon, the weath
bureau has undertaken the publication of daily forecasts, and at the sa
time the general spread of that knowledge which with time will render t
forecast unnecessary.

The *Hamburg Marine Observatory* is the Central Office; it is at the sa
time one of the Service Offices (Dienstelle) of which more will be s
below. It receives several times in the course of the day ciphered telegra
conveying the results of observations made at numerous home and fore
stations, with the help of which it draws up the telegrams for the home s
vice; these, under the name of *Deutsche Abonnements-Wettertelegram*
(German subscription weather telegram), can be obtained at redu
prices from all the German telegraph stations. These cipher telegra
are of three kinds:

1. The first *Wetter-Abonnement Telegramm* according to the form
BBBWW SHTTA RB'B'VN, contains the morning observations of
stations; it leaves Hamburg at 9.15 a. m., and costs 20 Marks (about
per month.

2. The *Abonnement Extra Telegramm*, according to the same form
gives the morning observations of 21 other stations. It leaves Hamb
at 9.45 a. m. and costs 10 Marks (about 10 *s*) monthly.

3. The *Abonnement Nachmittags Telegramm* according to the form
BBB WW SHTTV'. It contains the afternoon observations (2 p. m.
30 stations, and leaves Hambourg at 4 pm and costs 10 Marks monthly

In the above, *BBB* signifies the three figures of the barometer readi
omitting the first 7 and the decimal point, thus giving the tens, units a
tenths of millimeters, of course reduced to O° C. and sea-level. T
fourth and fifth figures, *WW*, indicate the direction of the wind,
figures from 00 to 32 being supposed to be disposed in a circle like the poi
of the compass, so that 32 represents the north, 08 east, 16 the so
and 24 west. Consequently 04 signifies north-east, 06 east-north-e
and so on.

The sixth figure, *S*, stands for the force of the wind according
Beaufort's scale. When this is above 9, the figure 9 is used and the force
wind given in words at the end of the telegram.

The seventh figure, *H*, gives the state of the sky, namely 0 cloudl
1 fine, 2 half overeast, 3 cloudy, 4 overcast, 5 rain, 6 snow, 7 mist, 8 f
9 thunder storm.

The following two figures, *TT*, indicate the temperature of the
in round numbers, the decimal 0.5 being rounded upwards. Only in
neighbourhood of zero the following notation is adopted:

— 0.5°	95	+ 0.1°	41
— 0.1°	91	+ 0.2°	42
0.0°	00	+ 0.5°	45

Further, *A* indicates the trend of the barometer, that is the change in sure during the three hours from 5 to 8 a.m. rounded up to whole milli-rs. The minus sign before *A* when the atmospherec pressure is falling dicated by an increase of 50 in the figures *WW* representing the direction he wind.

R shows the amount of rainfall during the last 24 hours according to ollowing scale: 0 = 0 millimeter, 1 = 0.1 to 0.4 mm., 2 = 0.5 to 2.4 mm., 3.5 to 6.4 mm., 4 = 6.5 to 12.4 mm., 5 = 12.5 to 20.4 mm., 6 = 20.5 31.4 mm., 7 = 31.5 to 44.4 mm., 8 = 44.5 to 59.4 mm., 9 = not rted.

B'B' indicates the barometric pressure of the preceding evening; the 7 is omitted and the reading is rounded up to whole millimeters.

V signifies, at the German stations, the state of the weather during the 24 hours, namely: 0 fine weather prevailing, 1 fairly fine (cirrus ls), 2 cloudy (low clouds), 3 lightning (more than one flash), 4 morning all, 5 afternoon rainfall, 6 night rainfall, 7 thunderstorm (at least hunder-clap and one flash of lightning or several thunder-claps without ning; requires always some short addition of words), 8 rainfall in ers, squalls, changeable, occasionally clearing up, some sunshine, ntinuous rain during a great part of the day or general rain with mostly ast sky. Between 0 and 3, at most 0.4 mm. of rainfall is assumed the afternoon cloudiness is especially important; from 4 to 6 more than nm. of rainfall is assumed but no thunderstorm, or at most one thun-lap without lightning. In foreign stations the cipher *D* is used to plete the data of some German stations. *N* is the first number of the essive numbers accerding to which the stations follow each other in telegram. Lastly *V'* (in the afternoon telegram) signifies the kind of her it has been between the morning and afternoon observations, ely: 0 mostly fair, 1 tolerably fair, 2 mostly clouded, 3 lightning (0 to), 4 slight rainfall, 5 heavier rain, alone or with snow or sleet, 6 heavier of snow (alone or with some rain or sleet), 7 thunderstorm, 8 rainfall howers, 9 continuous rain.

The whole country is divided into *meteorological service districts* ch of which a station (*Dienst stelle*) is situated, besides which some dis-s possess sub-stations (*Nebenstellen*). At present the stations and tations (in brackets) in Germany are the following: Hamburg, sburg, Oldenburg), Berlin, Königsberg, Bromberg, Breslau, Mag-rg, Frankfurt a.M., (Giessen, Saarbrücken), Ilmenau, Werlburg, (Cassel, enz), Aix-la-Chapelle, (Bonn, Dortmund, Essen), Dresden, (Planen, zen, which does not issue charts but only forecasts), Münich, Stuttgart, sruhe, Strassburg.

On the annexed map the North German stations and the boundaries eir districts are marked in red, while the limits of the forecast districts the sub-stations are shown in green.

These stations have the duty of following uninterruptedly the course e weather and of delivering reports daily, Sundays and holidays not pted, upon the actual weather and upon what is expected. As a basis

for these reports, besides the Hamburg weather telegrams, telegraph and postcard reports from the district itself are received and used. The are sent regularly and also whenever any meteorological event of speci interest occurs (such as cloudbursts, hail or thunderstorms). Besides t above, reports on the water-level of the most important streams of t district and special observations are also sent in.

On the basis of these communications and observations the stati has to prepare daily a weather chart and by means of a simple process make rapidly so many copies of it that the printed chart (which, besides t synoptic graphs of the weather made at 8 a. m. contains some observatio made in the district itself, namely water-levels, a review in words on t weather since the preceding day and a forecast for the next day) is rea to be mailed at 11 o'clock in the morning and wherever possible it reach the subscribers before evening.

This result has not yet been completely attained, though there is doubt that the value of the weather chart depends only upon its rapid dist bution and almost disappears when it is distributed on the following da There are, however, numerous localities in which the post is delivered on once a day and by a postman who starts from the railway station in t morning before the arrival of the weather chart for that day, which tak place in the afternoon. In such places the chart is already twenty-four hou old when it is distributed, and its value is very much reduced. In ord to remove this inconvenience, since the middle of October 1912 at t Hamburg station the experiment is being made of issuing a secon weather chart in which the evening observations up to 8 p. m. are give and which is ready for the post by 9 p.m. As this is but little over 12 hou old when it is distributed, it can be very useful in all those places in whi the morning chart does not arrive in time. The general introduction of th evening chart together with the morning chart would be very desirable but considering its cost it has not yet passed the experimental stage.

The price of the weather charts is kept as low as possible; it is general 0.50 Mark (about 6 *d*) per month, of which 0.14 Mark (about 1 $^1/_4$ *d*) postage expenses; in the Strassburg district it is 0.60 Mark (about 7 ¼ and in Bavaria inclusive of postage 1 Mark (about 1 *s*). In the Weilbu district the price for schools has been reduced - for an experiment - to 0. Mark (less than 5 *d*) including postage, when all the schools of a scho district subscribe for a whole year. The total number of weather char daily distributed in Germany amounted in the summer of 1912 to abou 13000; in winter the number was smaller. In many places such as school post offices and the like they are hung up to the public, and mostly the for three consecutive days. Besides this the weather charts are dail reprinted by many newspapers.

The Station has further to prepare daily the weather forecast whic covers from midnight to midnight and to supply it in a sufficient numb of copies (for the various lines) by 11 a. m. to the nearest telegrap station. As, however, the districts of the Stations are too extensive f one weather forecast, they have been divided according to their climat

ions (and partly also according to their telegraph lines) into forecast
ts (shown in green on the annexed map) and the stations are authorized
d different forecats for these sub-districts. After some unsuccessful
ments in shortening the forecast by using code words, this is at pre-
ransmitted in plain language; not more than eight words are allowed,
erage number being five. During the summer service (May to
mber inclusive) this forecast is hung up shortly before noon in
rman telegraph offices and its communication by telephone may be
om the telegraph offices on payment of 0.10 Mark (about 1 ¼ *d*).
he subscription for regular communication of the forecast costs: by
one or ordinary post 2 Marks (about 2 *s*) per month; quarterly 4.50
lf-yearly 8 M.; by country postman 3, 6.75 and 12 M. respectively;
ress messenger (besides cost of rural messenger) 4, 9 and 16 M. In
the forecasts are only hung up where a special subscription is paid
Marks per month). This happens in some towns at the request of
ic authorities. It is hoped in future to extend the summer service
ember 1, as would be desirable in the interests of the vine and fruit-
g industries.

he *Sub-stations* like the Stations receive, the information necessary for
eparation of the weather charts and besides this they get from the
ns partly by telegraph and partly by telephone the general review
weather to be published on the chart and the forecast. Usually
drawing up the forecast a short telephonic conversation takes place
en the Station and the Sub-stations during which observations and
lerations are exchanged. The final drawing up of the forecast is
ssely entrusted to the Stations.

n order to keep the whole Meteorological Service in close touch with
cal agriculture, in most districts reliable collaborators (*Vertrauens-
r*) have been appointed. These are practical farmers, teachers of
lture and the like, at least one in each district, who constantly
e their attention to the Meteorological Service; they express their
n on the weather forecast and follow all the details of the work. Their
sm of the forecast is expressed in figures and sent every week on post-
to the heads of the Service. The value of these "percentages of hits"
very great, as the judgment cannot be kept perfectly free from indi-
l valuation, and besides the economical significance of correct fore-
g varies very much; thus, at a change of weather a correct forecast is
more valuable than during a long period of the same weather. For
reasons the "percentage of hits" and the comparison of those of dif-
t districts are not published; nevertheless, they often give the direc-
f the Service useful hints and have thus, in spite of many objections,
kept up. Further, the Vertrauensmänner transmit to the directors
of the wishes and proposals arising from the daily practice of
ng, and in this manner many valuable improvementes have been
in the meteorological service.

As has already been said, the most important duty of the meteoro-
l service consists in the timely sending off of the daily weather charts,

that is the spread of the observations of facts that have really happen while the official forecasting is destined to become gradually less indispe able. Of course this aim cannot be reached until the great majority of people, and especially of the farming classes, are in a position to und stand the weather charts and to consider their own local weather in conn tion with the state of the weather in the whole of Europe. It has th been made an especial duty of the directors of the Service to spr knowledge on the objects aimed at and methods followed by the Meteo logical Service, as well as on the limits of its capabilities.

Lectures and discussions in meetings of associations, especially agri tural and educational, as well as special courses for teachers and the in sion of meteorology in the curriculum of seminaries and universities, prov both for making grown-up people acquainted with the principles meteorology and for introducing this branch of science into the schools.

Moor Cultivation in Austria

by

Dr. WILHELM BERSCH,

Inspector at the Imperial and Royal Experiment Station for Agricultural Chemistry, Vie

Methodical and systematic efforts to encourage the cultivation of m land were begun much earlier in Germany and Sweden than in Austria. Moor Experiment Station at Bremen was founded in 1879, and to the v of this institution we are indebted for laying the foundations of our knowl of the formation, structure and efficient treatment of peat soils, in particular for the modern method of cultivation, which has taken place of firing the moors. The Experiment Station of the Swedish I Cultivation Society at Jönköping began its activities in 1887; as Sw also contains vast stretches of moorland, its area of work is as large as of the Bremen Station. The area of moors in Germany is stated to be a 7 000 square miles.

The situation in Austria is very different: whilst in Germany m frequently form enormous uninterrupted tracts of waste, largely State perty, Austria possesses a large number of moors of small extent, almo of which either belong to private persons, particularly needy small-hol or are common-land. Under these circumstances, the far-reaching sch of colonisation on a large scale, which at present form the main featu the State-aided endeavours towards moor-cultivation in Prussia, are o the question in Austria; here the problem is to establish numerous p able small holdings and to put many thousands of acres of moorlan the most suitable use, a use which is also of the greatest importance fo development of our stock farming, *viz.* the growing of fodder crops, for w no soil is anything like as well suited as properly cultivated moor

The model for Austria was provided by numerous instances of highly ssful starting of moor cultivation in Germany and Sweden. It was soon l that, with slight and generally unessential alterations, all that had learnt elsewhere could be applied in our country. These alterations ccasioned not by any difference in the characters of our moors, but ly by climatic influences. Moor belongs to the type of soil which s the greatest obstacle to the passage of water, surpassing even clay in espect. As many of our moors, especially those in the Alps, occur in rainy districts, particular attention must be paid to the proper regu- n of the ground-water. It is obvious that the draining of a moor, which primary condition for its reclamation, cannot be carried out in regions a rainfall of 1200 to 2000 mm. (48 to 80 in.) in the same manner as in h-West Germany and Galicia where the precipitations amount to only een 500 and 700 mm. (20 to 28 in.).

Our moors show no essential differences in chemical composition and nical origin from those of other lands, as has been shown by the numer- investigations of the Moor Cultivation and Peat-Utilization Section bteilung für Moorkultur and Torfverwertung") of the Vienna Station, ded in 1901. It is true that many of the Austrian moors on the iary rocks show a somewhat higher potash-content, but the total unt is small and it occurs in a form soluble with extreme difficulty, so — as with phosphoric acid — potash in the form of an artificial manure be applied. As regards nitrogen-content also, our moors are in agree- with those of other countries. The true moors are generally very poor s nutrient material and consequently always require nitrogen-manuring, the fens are generally much richer and contain the nitrogen in a more ly soluble form, so that they can frequently do without any addition rogen. There are, however, exceptions: many fens, especially before eat is much decomposed, dispose of such small quantities of assimi- nitrogen that their full cropping capacity cannot be reached; such fens, y rate in the first few years of cultivation, respond well to nitro- is dressings.

The climate, and in particular the heavy rainfall, also leads to a modi- on in the application of the manure. While basic slag and potash ormally applied in the autumn in districts with low rainfall, spring dress- have proved more suitable at the Admont farm of the Vienna Experi- Station. In the first place it has been found that the action of the ures is just as quick when they are not applied till the spring and dly it is obvious that in this way the unavoidable loss of plant-food g to the considerable leaching of the soil is reduced. The knowledge is fact is a great relief to the moor-farmer of the Alpine region; for n wait quietly for the warm season to set in, with the certainty thoroughly good results will be obtained if he applies his manures e end of April, or even if necessary not till early May. Manuring and ng frequently take place on the same day, and this produces no bad s when the preparation for roots and grain crops does not take place he end of April, and grass-seeds are sown in May. Peat is a bad

conductor of heat, and a considerable time must elapse before th gets sufficiently warm for the seeds to begin to germinate. Late s avoids the disadvantage of having the seed lying too long in the and cold ground, and gives a much more regular germination; the tively considerable warmth which very soon sets in in the Alps in much quicker growth, so that the difference between early and late crops disappears in a few weeks.

Spells of bad weather are frequent in the spring in the Alps, an snow melts gradually, so that the soil remains sodden and cold; for re:son thorough spring cultivation cannot be managed without long d disadvantageous to the farmer, and autumn ploughing becomes an lute necessity. Moor soil must as far as possible be got ready to re the seed in the autumn, so that only harrowing is required in sp Besides its generally recognized advantages, autumn ploughing is spec valuable for moor cultivation, as it gives full opportunity for the fro exert its loosening and opening action on the insufficiently decom peat. In this way the teams are spared a great deal of work and the soon takes on a fine tilth, so that the main condition necessary for the crops is fulfilled. Only on thoroughly tilled soil, sufficiently decom and loosened, will drains run evenly, and the same conditions are n sary for even germination of seeds and regular development of the y plants. The importance of this in growing fodder crops—the most valu form of utilization of moorland — is obvious. Only with thorough tillage a finely decomposed surface is it possible to get an even closed grass-d ing; but when this is obtained, the meadow gives yields generally far exc ing those of the best artificial grassland on mineral soils and has the cularly valuable property of keeping up its production even during periods of drought, thanks to the well-regulated supply of moisture f perly drained moorland.

Owing to the heavy and generally regular rainfall in the Alps, th operation for the reclamation of a moor is drainage, and this m carried out with the greatest care. At the same time, the conditions ar favourable here than in less rainy districts, in that the consequen excessive draining are generally not so much to be feared, since the rai heavy dews always provide sufficient moisture for the soil. Excessive dr should, however, be avoided, as it is ultimately detrimental and is u able from heavy expenses, which unnecessarily burden the improv accounts. Drainage should therefore be restricted according to local m ments; in particular, where artificial meadows and pastures are formed excessive drainage should be guarded against; in general the p principle holds good that moor soils should be more thoroughly drain arable crops than for artificial meadows, and pasture also requires drainage than meadow to prevent poaching by the cattle grazing o

The important question whether open drains or tile drains are preferred for moorland has been settled in principle in favour of the In these rainy regions, where the drains must be close together laying out of a system with only open drains would mean such a c

the land that the advantage of tile drains is clearly evident on purely ical grounds. Open drains also need continual inspection, and keeping in proper condition involves expenses which are not required for tile s; the cost of making bridges and the loss of cultivable surface are to be set against open drains. Further, with open drains pastures can be arranged by the use of special devices (fences, etc.) for the protection e ditches from the cattle. Lastly tile drains generally give a more effi- drainage than open ones. As soon as frost sets in on the moor soil, and urse also in the open drains, layers of ice form on the sides and bottoms top the running of the drain; in spring no water can run off till these yers are melted, which is often quite late after severe winters, owing e low heat-conducting power of peat. Tile drains, if laid deep enough, off the ground-water even in winter, and so allow the soil to warm up below; consequently tile-drained fields are generally free from snow and nd ready for working earlier, and for all these reasons are two or three s ahead of those drained only by open ditches. All these considera- are in favour of the wide-spread adoption of tile drainage; open s have the one advantage of supplying plenty of material for levelling, h would otherwise have to be obtained by making diggings on purpose. e rather frequent cases in which levelling of the land to be reclained essary, the matter can be dealt with by a combined system of open es for the mains and tiles for the minor drains. The collecting ditches which the minors empty should then be arranged regularly, and if pos- parallel to one another; they may be as much as 200 yds. apart, n this way allow of pastures being laid out, as only the main ditches fencing to keep the banks from being troddendown by stock.

One of the numerous differences between fens and moors is that the er are mostly rich in lime and decompose quickly after drainage, with nsequent aeration, and regular working, while the moors with their ime-content only slowly take on the crumb structure. The decompo- n of moor-peat is greatly helped by a single dressing of lime as quicklime, or carbonate of lime, provided the lime material is thoroughly mixed the cultivable soil. Under North German conditions a sufficient g has been shown to be 1800 lbs. of quickline, or its equivalent in for arable land, and 2700 to 3600 lbs. for grassland per acre of moor; er dressings generally do damage to the crops. In the Alps and also varia, whose moors and climate have much in common with those of lpine districts, it has been found that though such dressings can plied without harmful results, the same effect is produced by smaller nts, about half, always provided the soil is very thoroughly worked. uld take us too far from our subject to discuss the causes of this phe- non in detail; but it seems to be attributable to the higher summer ratures, and perhaps also to the severity of the winters, which

encourage and hasten the chemical and physical processess leading to
decomposition and reduction to earth of the moor-peat (1).

In North-West Germany good results have been obtained, especia
on large areas of true moor, by inoculation with nodule bacteria, wh
allow of nitrogen-assimilation on the part of Leguminosae; this method
introduced there by Saalfeld. Without such inoculation, which is genera
carried out by spreading soil containing the bacteria, the growing of le
minous crops is not practicable except by addition of sufficient quan
ties of nitrogenous manure. The conditions are different on the moors
our Alpine districts: here the nodules form well without any inoculati
so that artificial introduction of the nodule organisms is superfluous. T
is attributable to the small extent of the individual moors in our countr
those of over 250 acres are by no means common and belong to the lar
estates. As they are mostly surrounded by cultivated mineral soils i
evident that soil inoculation will have no special effects, as it is already
ried out regularly by the wind. It succeeds in spreading particles of
laden with nodule organisms evenly over comparatively small areas,
does not extend its action to the extensive tracts of moor in North-W
Germany, so that there soil inoculation will continue to play an import
part, at any rate as long as the bulk of this moorland remains unreclair

In spite of the small extent of most of the Austrian moors, particul
those of the Alpine districts, moor cultivation is of great importance for
districts concerned. From the official moor-statistics (2) drawn up by
Moor Section of the Vienna Experiment Station, it appears that the n
property on crown land in Lower and Upper Austria, Salzburg, Styria, C
thia, Carniola, the Tyrol and the Vorarlberg comprises some 81 500 ac
this does not include the very abundant grass moors (« sauren Wiese
which are to be reckoned as moors in course of formation and re
similar treatment for reclamation, though they do not supply utiliz
peat. The average yield of good artificial meadows on moor soil
according to all experience, be set down at 56 cwt. of first-class hay per
but it frequently reaches much higher figures, especially on fens, eve
cwt. or more. The reclamation of the Austrian Alpine moors would
mean a very important increase in the production of first-class fodder
consequently in the number of cattle kept — and this without consid
the increased value of the land. Thus, while moor in its original cond
gives practically no yield, it can be permanently improved with non
small expenditure, and the moor soil then forms the best and kin
cultivated soil we possess.

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(1) For farther information, especial on the draining, cultivation, manurin
of moors, see: BERSCH, Handbuch der Moorkultur, 2d. edition. — Vienna, W
Frick, 1912.

(2) " Nachweis der Moore in Niederösterreich, Oberösterreich, Steiermark, Kä
Krain, Tirol und Mähren ,. Prepared by the Imperial and Royal Experiment Sta
Agricultural Chemistry of Vienna, by order of the Ministry of Agriculture. Pu
under instruction, by Wilhelm Frick 1911.

he conditions in Austria are such that the moor-farmer — at any rate Alpine districts — can rarely bear the whole expense of the improve-, as he lacks not only the confidence and the practical experience ary but also the means. The confidence of the farmer is first gained irses of instruction and lectures, and by the establishment of model meadows; the p'ans for the improvement are then drawn up at the se of the Central or Local Government, and the authority in question les substantial assistance, generally amounting to 60 per cent. of the expenses, to the Drainage and Moor Cultivation Cooperative Society nally, further support is given in the shape of implements for working oor soil, artificial manures and grass-seeds. In this way it has been pos-n many places to convert almost wholly unproductive moors into first-artificial meadows, and thus to encourage cattle breeding and at the time to furnish examples of the advantages of cooperation in this direc-

he cooperative production of peatmoss litter is also encouraged by overnment, by the provision of machines for its preparation. Moors were formerly left idle, or at most formed pasture of the poorest qual-ow enjoy the appreciation which is their due, and this finds expression increase of prices of moorland.

Whilst, as far as climate allows, almost any moor can be used as arable yet the production of fodder is the most profitable use to which moor-an be put, and this type of farming gives as good results in Austria, particularly in the Austrian Alps, as elsewhere.

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rimental Results obtained of Recent Years by the Section f Agricultural Chemistry of the Central Agricultural Experi-ent Station of Stockholm

by

H. G. SÖDERBAUM,

Chief of the Section.

I. — NITROGENOUS MANURES.

Experiments with new nitrogenous manures or substances proposed as yanamide, nitrate of lime, dicyandiamide, cyandiamidine. - Both wheat e have proved much more sensitive to cyanamide than oats. An ad- of 0.75 gram of nitrogen, under the form of cyanamide, per pot con-; 26 kg. (57.2 lbs.) of earth, which did not cause the slightest harm acted so unfavourably upon wheat and rye, — even when applied

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See also: "Moorkultur und Torfverwertung auf genossenschaftlichen Grundlage xreich„ by Dr. WILHELM BERSCH, in *Jahrbuch der Moorkunde*, Year 1, 1912. ', M. and A. Schaper, 1913.

a week before sowing, — that the majority of the plants died within weeks. Only after sowing again did the plants develop quite normall

As for the increased yield in grain, cyanamide gave with wheat to 80.2, and with oats 30.8 to 64.1 per cent of the effect of nitrate of For the total yield the corresponding figures for wheat were 61.8 t and for rye 44.8 to 66.5 per cent.

With oats the action of cyanamide was much nearer that of nitr soda. The observed relative increases of yield were, considering t crease due to nitrate of soda to be = 100, for grain: 98.2 to 99.1, a the whole crop 91.6 to 93.9.

With cyanamide manuring the nitrogen content of the straw w ways greater than with any other form of nitrogen.

Nitrate of lime in its effects on rye and oats stood on a level wi trate of soda; on wheat, on the contrary, especially for the yield of it proved decidedly inferior.

Dicyandiamide caused unmistakeable signs of poisoning in oa their yield was inferior to that of the lot without nitrogen. The a cation of dicyandiamidine under the forms of sulphate or phospha caused the plants to be sickly and to develop very scantily.

2. — *Experiments with sulphate of ammonia.* — The plants expe ted upon were oats, barley, wheat, rye, carrots and potatoes. The s of ammonia had throughout very good effects on oats, and espec when the phosphoric acid was given under the form of bone meal slag. If the action of nitrate of soda be taken as 100, that of sulp ammonia ranged from 90.8 to 195.8. The variations in favour of a were thus as a rule much greater than those observed with nitrate As for barley, a mixture of nitrate of soda and sulphate of amm equivalent quantities gave somewhat better results than nitrate As exclusive source of nitrogen, ammonia gave much worse result rye, ammonia was somewhat superior to nitrate, while with wh reverse was the case. Carrots and potatoes on the whole profited by either nitrogenous manure.

3. *Top dressings with cyanamide alone or in conjunction with n lime.* — Experiments with oats in which, besides cyanamide, the fo manures were applied and their effect as sources of nitrogen compar each other: nitrate of soda, nitrate of lime, and mixtures of cyanam nitrate of lime in the proportions of 1 : 1 ½ (A) and 2 : 1 (B). All manures were given in one set of experiments eight days before sow in another as top dressings after the plants had appeared.

a) Nitrogenous manures applied before sowing.

Nitrate of lime proved equal to nitrate of soda. Also the effect amide was quite good and on the grain yield was even slightly bet nitrate of soda. The mixtures of cyanamide and nitrate of lime gav yields than either of the two by itself. Mixture B was the bes when double doses of nitrogen were given no ill effects caused b amide were observed.

b) Nitrogenous manures used as top dressings.

he effect of both nitrates, and especially that of soda, is notably in- d when they are used as top dressings; on the contrary all the mixtures ning cyanamide proved injurious when given in this way; in some cases ants experimented upon were enfeebled and in others they were com- r destroyed. Consequently cyanamide gave lower yields than the lots it nitrogen.

Experiments with so-called basic nitrate of lime and "granulated" nide on oats. — The effect of the above manures was compared with f nitrate of soda and of sulphate of ammonia. When the nitrogen- anures were mixed with the soil in single doses, basic nitrate of lime he best result, while in double doses sulphate of ammonia was super- In the first case the differences were so slight that the effects of ni- of lime may be considered approximately equal to those of nitrate a and of sulphate of ammonia. The action of the "granulated" mide was somewhat inferior. As in the preceding experiment, cyan- as a top dressing caused either the death of the plants or a temporary ning.

Comparative manuring experiments with nitrate and ammonia on s. — It was found that ammoniacal nitrogen was on the average more able than nitric nitrogen. If the increase of fresh roots obtained rate of soda be set equal to 100, the corresponding increase caused phate of ammonia was 145,4. The weights of the dry matter in the stood as 100 : 126.7. The results tally with those obtained in pre- field experiments.

II. Phosphatic Manures.

On the after-effects of some phosphates. — The following series of experi- , which extended over five years, were carried out on pots containing (55 lbs.) of sandy soil, with the object of determining the relative ial values of superphosphate, precipitated dicalcium phosphate, pre- ed tricalcium phosphate and steamed bone flour. The plants em- l were oats and barley. The experiments show that the total effect manures during the five years is superior in the case of the lighter e phosphates. The effect of the dicalcium phosphate was about equal t of the superphosphate. Both of them were decidedly superior to f the less soluble phosphates (bone flour and tricalcium phosphate) is also in those cases in which (as with bone flour) the results during st year had been equal or nearly equal to those obtained with hossphate.

he effects of superphosphate and of dicalcium phosphate during the five years were not, in the main, influenced by the addition of calcium ate, while on the contrary the effects of bone flour and of tricalcium ate were much reduced and finally completely obliterated by cal- arbonate. The partial substitution of nitrate of soda by sulphate

of ammonia has almost always slightly increased the utilization by the plan of the less soluble phosphates.

The results of the experiments are in opposition to the frequently actu cated opinion that the lower direct effect of the less soluble phosphate is compensated by their abundant after-effects.

2. *On the manurial value of some phosphates.* — The following pho phates were experimented upon: *a*) Tunisian phosphates; *b*) precipitate bone phosphate; *c*) electrolytically precipitated dicalcium phospha (so-called "Palmaer phosphate") obtained partly by rapid and part by slow precipitation; *d*) artificial phosphate of iron, $FePO_4$, and so-called "Bernard phosphate", said to be prepared by calcination low grade crude phosphates. The experiments were carried out w oats in pots containing 26 kg. (about 57 lbs.) of sandy soil.

If the increase of crop due to superphosphate is taken as equal to 10 the effect of Tunisian phosphate was 22.2, while that of precipitate bone phosphate was between 111.2 and 116.6. The slowly precipitate dicalcium phosphate had a somewhat less favourable action than that the normally obtained one. The increase of yield due to the phospha of iron was about one-fifth of that due to superphosphate. Lastly the Be nard phosphate showed no effect at all.

3. *Experiments with nitrophosphate* ("*Nitrat phosphat*"). The so-call "Nitrat-phosphat" is produced by the Norwegian Hydro-electric Nitrog Co. by treating crude phosphates with nitric acid. The manure that w examined contained 30 per cent. lime, 30.5 per cent. phosphoric a and 3.6 per cent. nitrogen. It was thus in the main a dicalcium phospha As experimental plant, oats were used. The manurial value of superph phate being 100 that of the nitrophosphate was between 100 and 10 The action of the phosphoric acid in this manure was thus very nearly same as that in superphosphate.

III — Various other Experiments.

1. *Manurial value of so-called nitro-ammonia-lime* ("*Nitrammonkalk*"). Exhaustive experiments showed that nitro-ammonia-lime, a manure pr duced by the action of quicklime on sewage sludge, owes its favourab action chiefly to the lime it contains and only to a very small extent to i insignificant content of real plant foods.

2. *On the manurial effect of common salt.* — The experiments in th connection were carried out with oats, which were grown on a poor sand soil not specially deficient in potash. Nitrogen was given as nitrate of so and sulphate or chloride of ammonia, and each of these nitrogeneus manur was given with and without a quantity of common salt (3.1 gram per po corresponding in sodium content to the nitrate of soda.

From the investigation it resulted that the addition of common s caused a considerable increase in the yield in those cases in which nitrog had been given as nitrate of soda or as sulphate of ammonia, but not und the form of ammonium chloride + sodium chloride. No injury due to manu

with common salt was observed. The results of the experiment justify conclusion that, at least in the present cases in which more than suffi- t quantities of potash and phosphoric acid were already present in the ure, and the water requirements of the plants were met by watering, the ease of yield obtained by the addition of common salt is due to the t manurial effect of the sodium chloride, and especially of its chlorine ent, which further agrees with the fact that the soil on which the experi- t was carried out was rather poor in this element.

2. *Experiments with radio-active manures.* — A so-called " radio-active lytic" manure was also tested as to its manurial value. The substance, h consisted chiefly of a silicate of potash and alumina, was given in s of 0.1, 0.5, 1.0 and 5.0 grams per pot. In all cases sufficient quanti- of nitrogen, phosphoric acid and potash were given. The result obtained oats on sandy soil was that the substance in question was completely nless, but did not seem to promote the growth of the plants to any reciable extent. Only with the large dose of 5 grams per pot was a ll increase of crop obtained, and this barely beyond the limits of error.

4. — *Growth of plants in granite meal.* — In this series of experiments pot contained 26 kg. (57 lbs.) of a powdered Swedish so-called " Stock- n " granite, the particles being of less than 3 mm. diameter. The experi- lts were conducted on the following plan :

a) Without manure.
b) Phosphoric acid + potash + lime (without nitrogen).
c) Nitrogen + potash + lime (without phosphoric acid).
d) Nitrogen + phosphoric acid + lime (without potash).
e) Nitrogen + phosphoric acid + potash (without lime).
f) Complete manure.

Of each combination three parallel pots were prepared. For the ob- of comparison there were also three pots with common earth taken a field to which complete manure was added. Oats were used in the riment.

It appeared from the experiment that the granite when completely ured or manured only with nitrogen and phosphoric acid gave yields as idant as those from the completely manured field soil, and consequently not only to satisfy the lime requirements of the plants experimented , but also their needs of potash. On the other hand, as was to be expec- this powdered granite had no effect as a nitrogenous manure and only ry slight one for phosphoric acid.

Recent investigations make it seem probable that the great effect anite as a potash manure is principally due to its mica content.

The Present Conditions of Forestry in Italy

by

Prof. LODOVICO PICCIOLI,

Forest Inspector at Catanzaro (Calabria).

In order to give an idea of the condition of our forest wealth and of th difficulties which are encountered in framing a single code of forest legi lation without prejudice to the interests and customs of the populatio it is sufficient to review rapidly the uncertain and desultory evoluti of the laws in their hydraulic, economic, hygienic and pastoral aspects.

Between 1860 and 1877 every region of Italy had its own forest law In what had been the kingdom of Naples on the mainland, the law of Fra cis I of August 21,1826, which was extended to Sicily by the decree of Marc 26,1827, was still in vigour. It was perhaps wiser than the others and might have been extended to the whole peninsula with advantage to th forest economics of the country. In Tuscany, after the edict of Peter Le pold of October 24, 1780, the greatest liberty prevailed. Piedmont obeye the letters patent of Charles Albert, dated December 1, 1833, and Janua 28, 1834, and Sardinia those of September 14, 1844, and the decree of Victo Emanuel II of November 4, 1851, which was later extended to the March and Umbria. In Venetia and in Lombardy the decree of Eugene Napo leon of May 27, 1811, was still in force.

The Hon. Majorana Calatabiano attempted to remedy this want uniformity in the legislation by means of the law of June 20, 1877, whi is still fundamental in Italy. It is very liberal, being based on the opinio that in order to promote forestry free competition is more advantageo than monopolies and servitudes, and that when the demand is greater th the supply there would be no lack of landowners who would be induc by the prospect of profit to grow timber. In this law liberty is thus t rule and servitude the exception, the latter being limited to those co bearing upon watercourses, upon the protection of the land against e sion, etc., and upon public health, but without any consideration of e nomic, climatic or aesthetic factors. There was no provision for rend ing reafforestation compulsory.

This law ushered in a great destruction of forests. Whilst the area forests under the surveillance of the administration was 12 463 543 ac on January 1,1877, it was reduced to 7 402 395 acres on June 30, 18 and by successive freeing from servitudes to 7 251 130 acres on Ja ary 1, 1900.

Too much trust was placed in the good effects of liberty and not enou consideration was given to the often imperious motives which induce la owners to fell their forests and to the difficulty of finding people will

ark their capital in afforestation schemes trusting to the market con-
of a century later. Subsequent events proved that only a portion of
voods was destroyed with the object of transforming the soil they
ed into fields, meadows and vineyards, thus increasing the wealth of
untry. The greater part of the forests were ruined by the excessive
to which the owners were driven by their straitened financial position
the demands of the market. Concomitant causes were also the hap-
grazing and the primitive manner in which farming was carried
on the cleared lands; usually after a few years they were abandoned
action of the water, which leached them out and carried away the
ble soil which had accumulated in the course of centuries.
is believed that upwards of one-third of the forests freed from ser-
s have already been ruined, and that another third is deteriorating
t before long it also will disappear. Some instances taken from offi-
ublications will give an idea of this work of destruction: In the Sila
ria) 77 341 acres of land freed from forest servitude were broken up and
o rye, flax and potatoes, *the timber being burnt on the spot as it could not*
. In the province of Sassari (Sardinia), 407 550 acres of high forest and
e were freed from forest servitude and the owners were left abso-
free to do what they liked with them. They paid no attention to either
reservation or the regeneration of the forests, because after the trees
felled, the unrestricted destructive grazing of all kinds of animals was
ed.
hat the measures concerning the freeing of forest servitudes were
injurious and that the list of such abrogations were hastily drawn up,
s being full of errors and not sufficiently controlled, is proved by the
hat in many cases it has been found necessary to propose the reimpo-
of the servitude, and that in general, and especially along the Apen-
and in Sardinia, many of the freed belts have become bare stony slopes,
precipices or steep clay banks burnt up by the sun, which seem to
every attempt to render them fertile or clothe them with forests
onomical methods. Liebig used to say that a population that allows
ertilizing substances of its land to be carried into the sea during a cen-
will be obliged to follow them and to emigrate, and Victor Hugo wrote:
la substance même du peuple qu'emporte, ici goutte à goutte, là à flots,
effrable vomissement de nos fleuves dans la mer". This indeed has hap-
d on the slopes of the Southern Apennines, where a part of the mis-
is no doubt due to geological causes beyond the control of man; but
r the greater part of it is the effect of the wastefulness and neglect
an, who has paid no heed to the equilibrium of forces in nature and
ot considered the far-reaching effects of his act.
There were not wanting scientists and parliamentary men who attemp-
o stay this continued work of destruction. But failure attended every
to introduce a real forest law providing for the conservation and im-
ement of existing forests, for the afforestation and putting to grass
ose lands that cannot be kept permanently under more profitable crops,
he extension of wooded pastures, for the conciliation of sylviculture with

animal husbandry to the advantage of the inhabitants of the mount
and lastly for means of prohibiting large landowners neglectful of th
social duties from letting immense tracts of land go to ruin..

The Law of March 1,1888, on reafforestation, of which the Regulati
for its application were not even published, had such meagre results, th
it could be considered a dead letter.

From the official statistics it appears that between 1867 and Decem
31, 1904, the area reafforested at the expense of the Government or w
its assistance amounted to 129 302 acres, with an outlay of £131 885. T
in 38 years the area reafforested is 27 times smaller than that freed from s
vitude in the second half-year of 1877. It seemed as if an adverse destin
weighed on Italian forests, and even after some disastrous inundations
remonstrances in the Chamber of Deputies failed to obtain a satisfact
solution of the forest question.

Guido Baccelli, who in spite of the ridicule of his adversaries had fou
ded experimental school gardens and instituted Arbor Day, has the m
of having succeeded in putting through the first Bill (that of December
1901) affirming the aesthetic importance of forests; this further set a
as health resorts the celebrated forests of Vallombrosa, Camaldoli and Bo
lungo in the Tuscan Apennine, the Cansiglio forest in the province of B
luno and the Ficuzza forest in the province of Palermo. Baccelli also
the courage to present a Bill on April 26, 1902, subjecting to servitu
every wood in the kingdom whatever its position; but this was, doom
to failure, and after having been approved by the Senate it was bur
in the offices of the Chamber, notwithstanding that it contained
germs of that new feeling for forests which was so soon to bear fruit an
usher in the period of the restoration of woods. Thus on June 26 the n
sures for the protection of forests in the Sele catchment basin were appro
This step, for the first time in Italian legislation, affirmed the princ
admitted by the Romans that forests supply the sources of rivers
regulate their course.

On March 31, 1904, the law on Basilicata came into force; in impos
the forest servitude, this recognises, besides the interests of the hydr
lic and hygienic conditions, the economic factor also. It provides for exe
tion from land tax in favour of those who reafforest, and grants them pri
and it authorizes the outlay of £856 400 for the regularization of the wa
courses in the plain and in the mountains, including the work of rea
estation and of strengthening the slopes.

The law of June 25, 1906, on Calabria confirms the exemptions fr
land tax and the giving of prizes in favour of those who reafforest, and vo
£935 700 for the regularization of the watercourses in the plain and in t
mountains, £352 000 for drainage, and £137 400 for consolidating slo
that threaten inhabited centres with landslips.

On July 19 of the same year the law on Vesuvius was passed; it auth
izes the outlay of £234 000 to repair the damage caused by the erupti
and by the subsequent downpours, and to provide for the regularizat

watercourses and woods, besides a further £80 000 for the same regu-tion on the southern slopes of Vesuvius.

)n May 5, 1907, the law on the Water Board for the provinces of Ve- and of Mantua was passed. This provides one administrative office ıe control of the public waters in the provinces of Venice, Padua, Tre-Vicenza, Verona, Rovigo, Udine, Belluno and in that portion of the nce of Mantua lying between the Po and the Mincio; this law is the ning of a wise decentralization in the management of waters and forests.

)n November 10, 1907, the measures for Sardinia were approved, and)ril 5, 1908, a sum of £8 000 was voted to assist the work of improving astures, preference being given to those belonging to communes and iations.

)n June 2, 1910, Luzzatti's law was passed for the constitution of a State forest domain and for the protection and encouragement of ıulture, and on December 22 of the same year another law on the works carried ont on the waters and forests of mountain basins was approved.)ws the outlay of £ 198 000 in the first five years and £ 793 000 in the fifteen years. On July 13,1911, another law on mountain basins, control and drainage was approved.

The last statistics published (on December 31,1907) refer to the s subject to forest servitude. The figures are reported in the agricul-land book (catasto) of 1910, together with the area of woods not sub-to forest servitude; these (including chestnut woods) are given in the ring table:

	Under forest servitude	Free from servitude	Total
	acres	acres	acres
orest	3 840 850	1 449 186	5 290 036
e	3 512 340	2 470 000	5 982 340

The total wooded area from 1870 to 1910 was as follows:

In 1870, according o Maestri	In 1874, according to the *Annuario Statistico*	In 1902, according to Stringher	In 1910, according the agricultural land register
acres	acres	acres	acres
430 624	11 132 854	9 666 943	11 277 396

The above figure for 1910 is 17.03 per cent. of the area of the country. The values of the imports and exports of forest produce and of forest try during the last eleven years have been as follows:

Year	Imports	Exports
	£	£
1900	2 455 342	387 613
1901	2 557 237	412 301
1902	2 565 494	439 561
1903	2 718 190	472 271
1904	2 072 481	409 659
1905	2 202 599	300 251
1906	3 983 540	284 704
1907	4 734 132	287 440
1908	5 474 484	319 239
1909	9 355 083	237 209
1910	6 300 728	267 013

There are no precise data as to the yearly production of timber, but a approximation is given by the following table based on the calculation th an acre of high forest yields 36 cub. ft. of wood, an acre of coppice 43 cu ft., and the 29 million acres of fields, wooded pastures, brushwood an hedges yield 7 cub. ft. per acre.

Production of timber, in cub. ft.

From high forest	From coppice	From the fields	Total
189 097 566	256 613 000	212 000 000	657 700 00

The insufficiency of normal production has been hitherto met excessive felling, which has encroached upon the capital of timber, a by importation, which increases to an alarming extent.

The law on the forest domain has considered the difficult problem the restoration of forests with great breadth of view and has attempt to remedy the fundamental defect of the present servitude, which on the bo lands ends by causing much harm. It is injurious inasmuch as it forbi the breaking up of the land to convert it into fields and meadows, whi would often protect the soil exposed to the erosion and washing away

ial rains: further, as it is not connected with the positive duty of sting and of consolidating slopes liable to landslides, it is an encour- t to inertia. The law on the forest domain considers the problem e standpoint of public utility, not only as connected with the hydrau- ienic and economic aspects, but also with the aesthetic and histor- s. Due attention is also paid to those forests which provide the ork available to the inhabitants of mountain communes. But it : enough to provide for the defence of the soil by the improvement vatercourses and of the forests; it as also necessary to increase our omain, by creating large extents of forest sufficient to meet the future of timber from which our country will certainly suffer. Thus the administration will purchase bare lands suitable to profitable ation and badly managed woods, taking the place of private ownership an ill afford to wait a long time for the returns. The admini- will also exert the necessary persuasion on corporations and pri- mers by setting an example of good management and will also as- n by means of active propaganda, advice, technical direction, prizes emptions from taxation calculated to render forestry in the moun- ore profitable and consequently preferable to other forms of exploi- The forest officials should become the natural protectors and advisors engaged in forest industries; they must make a radical change tactics, which can no longer consist in perpetually threatening penal- inst the destroyers of forests, as this system has proved ineffectual maintenance of existing forests.

the execution of this vast programme, which includes also the re- education in forestry, considerable sums have been voted; for the e years (July 1, 1910, to June 30, 1915) these will vary between 000 and £ 1 300 000 according to the eventual surplus in the general of the State.

er the first trial five years, and considering the results obtained hat time, the future yearly vote will be established. A rather opti- stimate compiled in 1910 by the Central Inspectorship of Forests General Budget Committee, suggested the possibility for the State ing by means of an outlay of £ 6 185 000 to be spent in 25 years domain which in its seventy-fifth year would be worth almost 60

ier provisions, apparently less important, but of great practical r those who know the useful conservatism and the injurious passive ce of bureaucracy, are those concerning the establishment of a technical general direction relatively independent, distinct from er, drainage, domain, and easement services and from territorial s, and resembling the Water Board of Venice and the chief inspec- ices of the civil engineering service.

s law, the result of much study, has a clear vision of the best way ning its object, and is the greatest parlimentary achievement in atters since the union of the kingdom.

Forest legislation has progressed considerably since 1902, and alm
every year it has been increased by a new law. Now, rather than by
enactment of new laws which would risk plunging us into the sa
chaos that existed before 1877 and keeping us in the midst of propos
instead of fa ts, it would be desiderable to solve the forest question
means of the existing laws, applying them firmly and perseveringly.
there is one measure necessary to restore to the mountains their wea
of water and forests, it is the tranquil constancy of direction which
enable the owners of forests to proceed quietly and continuosly in th
work like nature herself.

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The Selection System in Forest Economy

by

AUGUST KUBELKA,

*Imperial and Royal Chief Forest Councillor, Director of the Forest Experiment Sta
at Mariabrunn near Vienna.*

The selection system (" Plenterbetrieb ") is the oldest method of f
exploitation, for it was practised when the science of forestry was st
its infancy ; further it is the system of exploitation which most closel
sembles the operations of Nature.

The literature dealing with the selection-forest (" Plenterwald "
unusually rich, and there is scarcely any other question connected with

ıpon which the opinions of experts are more diametrically opposed. case of such a forest, it is very easy to draw false conclusions from able subjects or from the results of wrong management. The modern r regards the selection forest with a certain lofty contempt, and thinks tence is only justified where it affords protection or for forests under de.

Austria at the present time, this system is usually confined to the limits of the forests and to very steep slopes and small areas under de which are required to furnish a yearly supply of wood. The n is, as a rule, fixed at from 140 to 160 years, though in exceptional t is prolonged to 200 years. In this manner, the selection system is ften applied to stands of trees all of the same age, and frequently of educed seed production owing to their advanced age. To convert ands into a selection-forest is no easy matter, and is effected in the ng way.

careful preparatory felling is carried out for the purpose of removing he stands all diseased trees and some of the unshapely trunks, as well dead ones. This is succeeded, after some years, by very careful ng 10 per cent. at most of the mass being removed and great atten- ing paid to the selection of the trees which are to be felled. These ngs, are repeated at intervals of 5 to 10 years and are carried out by re- g groups of trees; due regard must be paid to the light requirements underwood which has already made its appearance. In case no re- tion has taken place, recourse must be had to planting.

method of selection which entails the removal from the stands of rongest trunks and the leaving of the diseased, unshapely and ered ones which do not pay for felling, has no effect in promoting l regeneration. The latter does not take place because no prepara- ıave been made and the area thinned has been kept too dark; on her hand, the damage due to felling and removal are clearly felt. ter clearings obtained in the same manner are generally equally essful. These failures, together with the great demands made upon restry staff, are possibly the cause of the selection system being re- l in Germany and Austria as an unsuitable and ineffectual method, and ıaving fallen into much disuse.

ands of the true selection-forest type occur in Austria usually in gh mountain districts, the so-called "Alpwälder"; owing to want of ıd to some extent to frequent grazing by cattle, they generally make ng but a satisfactory impression.

is no doubt the condition of these stands which has called forth the y unsupported statements that selection-forests yield wood of infer- ality because the breadth of the annual rings is too much influenced continual interchange of close and open stands; further, that such produce less timber than even-aged forests, because in the former nks are much shorter, more liable to decay and more branched.

hese assertions cannot be regarded as of universal application, since ıancial success of a well-managed selection forest does not suffer from

short trunks, inferior quality of wood or too great abundance of branc
Forest Inspector Schatzle (Germany) has shown, for instance, that in
Black Forest of Baden the timber yield is 74 per cent.

The opinion of the well-konwn investigator Dr. Robert Hartig rega
ing the quality of the timber of selection forests is as follows: "The timbe
these trees is of excellent quality; in the selection-forest they grow cl
together and in deep shade when young and are gradually given more spa
Their growth often increases up to 300 years, so that the width of the annu
rings only decreases slightly towards the outside. With increasing grow
the quality of the wood also improves up to a great age, and thus exc
lent timber is produced throughout". In another place he says: "T
most prized product is the fine-ringed timber from closed associations, es
cially the wood of stands derived from natural regeneration".

With regard to the deficiency in wood and the branching of trees of t
selection forest, the Austrian investigator, Josef Wessely, in his wo
"Die österreichischen Alpenländer und ihre Forste", states as follow
"Growth to old wood is usually astonishingly regular. This is no less t
case with longitudinal growth, though this is generally relatively great
than growth in any other direction, which is clearly due to the struggle
reach the light, and occasions a strikingly complete lignification of the stu

"Under these conditions (large number of stems and pressure fr
above and at the sides) the branches are naturally unable to become thi
and the stems continue to shed them until they attain a great age; hen
of the unwonted cleanness of the trunks."

This remark of the Austrian authority referring to the stands in cont
rous forests, which perhaps now no longer exist in such an original form, gi
us material for reflection. We have no right to call the selection system an
quated and ineffectual so long as we cannot bring forward convincing pro
the truth of this statement.

We now come to the principal question, *viz.* how the growth and ti
ber yield of a selection-forest compare with those of an even-aged stand gro
under open conditions.

Wessely has not yet given us a definite answer to this query. He do
however, maintain that in a spruce station spruce gives a better and mo
sustained growth in selection forests than in even-aged high forests.

Nowadays we often meet with the view that the yield of the selecti
forest is on the whole low, and that great productiveness in the latter
only to be obtained in very favourable situations. This statement is inc
rect. The yield of such a forest is certainly low at first, and much time, to
ther with skilful management, are required before it can attain its full p
ductivity, and before soil and stand reach a condition permitting a la
quantity of timber of best quality to be obtained.

In a silver fir selection-forest near Rippoldsau in the Black Forest
Baden, Prof. Schuhberg measured in 1886 an annual increase of 263 c
ft. per acre. A selection stand covering 250 acres in the parish of Schwapp
in the Black Forest increased in mass between 1879 and 1899 by

t. per acre per year ; these are unique performances which have not equalled in even-aged high forests with similar growth conditions. arge yields have also been recorded in Switzerland, the true home of of this type. Dr. Fankhauser showed in 1908, in the " Schweizerischen hrift für Forstwesen ", that the selection-forests in that country gave rease of from 143 to 176 cub. ft. per acre at elevations of 800 to m. (2650 to 4 000 ft. above sea-level).

rom these statistics, of which the accuracy is beyond any doubt, the se in a carefully tended selection forest far exceeds that of an even-high-forest stand.

he greater resistance of the former, owing to the stand being composed es of different ages, is now fairly well known. Such a forest suffers from heat and frost, snow and ice, insect and plant enemies. But it erwise with the injuries due to man. Unrestrained felling, the use of for litter, the reckless employment of the forest as a grazing ground, wrought havoc with many selection-forests. What the latter can with-in this direction is shown in a striking manner by the peasants' woods Austrian Alps. These must eventually succumb to the continuous of the woodman's axe, and the ceaseless injury caused by grazing ; but they have resisted these attacks for an extraordinary length of and quickly recover, should a favourable chance give them a longer e.

Thus about ten years ago, a peasants' selection wood in Lower Austria, was in an extremely neglected condition, came into the possession of h-minded lover of woodlands. The new owner at once put a stop to rest's being exploited for timber and litter ; the result was a quite lible increase in growth, and the wood at present affords a charming re. The stand has again become completely closed and trees of all show luxuriant growth.

To give another example: the so-called " Grassgelack " in the Salzkam-roperties, which are burdened, and at times over-burdened, with of grazing and the collection of twigs for litter, are treated in an st barbarous fashion. The grazing season begins on the first of May the famished cattle fall upon the young tree-shoots because the grass not grown sufficiently to satisfy their hunger. The damage caused lling and timber removal is repeated every year ; nevertheless, where il is best the trees are thick and their growth is satisfactory ; it is only very poor dolomitic soil that the stands show gaps and that the growth cient. What, however, would have happened to these areas if clear ; had been adopted ?

We will now turn to the effect exerted upon the soil by selection forests. ubt now exists that continual protection not only maintains the good tion of the soil, but also increases it. The humus layer is especially l, as the weathering of the mineral constituents of the subsoil is y due to its agency. It is only in troughs or basins, where a derable quantity of leaves collect and lie, that acid humus, unfavou-to plant growth, is formed. With the exception of such cases, and

leaving out of account heaths and moors, the existence of a thick covering of humus cannot be other than advantageous to the growth of woody plants.

The continuous presence of a soil-covering and of the humus layer is certainly of effect in improving the soil. The surest proof of this is given by the primaeval forests. In those of North America, which, alas, will all too soon belong to the past, the indigenous species of trees (*Abies douglasii*, *Pinus ponderosa*, *Wellingtonia gigantea*, etc.) have attained giant dimensions. These American species will never reach this size in our ordinary forests though they would grow as large in Austrian primaeval forests as in those of America.

The soil conditions of a carefully tended selection-forest resemble those obtaining in a primaeval forest. In the former the soil is continually protected and covered, and is sheltered from the drying effects of sun and wind; the supply of humus increases, the physical and chemical composition of the soil gradually improve, the quality of the soil improves, and for this very reason the selection-forest is highly productive.

Now Fürst (Germany) has stated in his work entitled "Plenterwald oder schlagweiser Hochwald" (1885, p. 28) that the first requisite for success with the selection system, or this combined with the compartment system, is good damp soil, as only on such can our indigenous trees support heavy shading and repair injuries of all kinds. The selection system can not be practised in poor, dry situations.

Assuming this to be correct, we must draw the conclusion that just in the case of poor soil that we must dispense with the very system of cultivation from which we have every right to expect improvement in the soil conditions, and are forced to fall back upon the method which appears the worst both from the forestry point of view and from that of maintaining the quality of the soil. *i. e.* we must choose the clear felling system for inferior soil. This assumption should, however, be regarded as quite unwarranted. For in the Austrian Alps there are many wooded areas which after clear felling could not be reafforested, but gradually degenerated into "Karst" in spite of every care and attention and great financial sacrifice, while neighbouring stands managed according to the selection system, without receiving any special attention, are in a very satisfactory condition. Central Director Hufnagl has shown in his article "Der Plenterwald, etc." which was published in 1893 in the "Oesterreichishe Vierteljahrsschrift für Forstwesen" that a selection-forest on rocky "Karst" ground with scanty soil produces an increase of timber of 93 cub. ft. per acre per year.

In this connection he says: "If we compare with this annual increase of 93 cu. ft., or, what is the same, a yield of 93 cub. ft. of timber per acre per year, the figures given in tables showing the product of stands of the same size and growing on soil defined as first class, and take Feistmantel's silver sub-class of silver firs, we find we have in the 120th year a mass of wood inclusive of faggots, of 9250 cub. ft. and an average increase of 77 cub. ft. if we subtract 25 per cent. from this for faggot wood, there remain 69 cub. ft. of timber in the 120th year, giving an increase of 57 cub. ft. per acre per year.

"Now a typical spruce trunk in an even-aged stand of 120 years is about
ches in diameter, while the selection-forest produces trees from 16
inches in diameter, so that the timber is of much greater value".
Hufnagl says further: "The selection system, which is pointed out as the
extensive method, really represents an individual tree management.
is well known to be our most intensive method". He concludes his
rvations with the following words: "Where different conditions of
ds already exist these should be retained, no attention being paid to
or that prevailing fashion in forestry; for only extensive local experi-
should or can be the foundation of changes in methods of cultiva-
Hours of calculation cannot prove what can be demonstrated in
minute by the callipers and the increment borer."
From the preceding observations we therefore conclude that the selec-
forest owes its great powers of increase, not to its favourable position,
rather to the careful management of the trees, and the consequent im-
ement of the soil. If we were to make a clear cut of such a forest, the
ve treasures of the soil would be dissipated in a few years, either by
ing or by the growth of weeds; the weathering of the mineral sub-
would be interrupted, and, under these circumstances, there could be
uestion of reafforestation.
There is a splendid selection-forest of spruces in the Royal Forest of
veggio (South Tyrol), which has been described in glowing terms by all
have visited it. Wessely describes it as follows: "The Panaveggio timber
nowned for its excellence as far as Verona and Venice. It is distinguished
s unusual thickness, its narrow annual rings and freedom from branches,
ell as by extreme durability. This well-managed selection-forest is an
st closed high forest, and only differs from ordinary old stands of even-
trees in the fact that its trunks are not so equal in diameter and that
poles, as well as occasional saplings, occur between the older trees".
In this forest, standing at 1600 to 1800 m. (5000 to 6000 ft.) clear fell-
would be entirely out of place, all the more so that different stand con-
ns are already in existence, and according to Hufnagl these ought to be
tained.
For our high mountains the selection system is of incalculable advantage
is often the only possible method. Those who regard it as an antiquated
em excluding all idea of progress have no conception of the difficulties
ding high mountain forestry.
In a work published in 1911 and entitled "Die intensive Bewirtschaf-
der Hochgebirgsforste" (The Intensive Management of Mountain
sts), I have (on page 33) spoken against a too long rotation in the case
oods on steep slopes treated according to the selection system; I main-
ed that the rotation period in such cases should correspond with the
test period necessary for the trees to reach maturity and to acquire
sable dimensions, because in this manner natural regeneration takes
e readily and as the trees are not so large as they become when older,
removal is easier and damage due to felling can better be avoided.
In explanation I should here like to mention that I did not wish to

say anything against the selection-forest, but in making these remarks I had in my mind the fact that stands on steep slopes treated according to the selection method, are usually composed of trees of the same age and are often very old; hence careful management is necessary and proper transport arrangements are indispensable.

We have now reached the most necessary condition for the practice of the selection system, *viz.* the opening up of the several forest districts by establishing well-planned transport stations.

In my above-mentioned work I said in this connection: "It has been shown to be an absolute necessity to open up our high mountain selection forests by means of flumes, timber tracks, etc., which will connect with the chief transport stations, and also to make the rotation period as short as possible; only thus shall we obtain a good supply of utilizable timber from such forests and ensure natural regeneration".

This condition applies not only to the high mountains, but also to the lower mountains and the hills, and where it is not fulfilled the careful forestry required by the selection-forest is not possible.

Unfortunately, as a rule the actual circumstances are very different. There are no transport stations in the mountain forests treated on the selection system. The timber is conveyed to the valley in the most primitive manner, usually by means of badly constructed earth slides, often even down precipices. In these forest areas, the selection is generally limited to the removal of dead and harmful trees, while in many instances such stands are completely left to themselves.

In the lower mountains and hills similar conditions, though perhaps not quite so unfavourable, prevail. The selection-forest is not regarded as a true commercial forest; it receives scant attention and the provision of good, adequate transport stations is considered unnecessary, probably from the idea that the yield of such a forest is small in itself and does not justify even a small outlay for opening it up.

With regard to wood transport and its cost, the selection-forest is always at a disadvantage when compared with clear felling, *i. e.* the expenses of transport are under all circumstances heavier. Even if it is arranged that longer intervals, say 20 years, shall be left between each felling so that the supply of wood shall be fairly large, still the disadvantage remains that the same amount of timber which occupies one acre in the clear felling, is scattered over 5 to 10 acres in the selection-forest.

Marking trees for felling in the latter is difficult, and takes much time. Even with the greatest care, injuries due to felling cannot be avoided.

These are briefly the chief reasons of the objection to the selection system.

In addition, the foresters of the present day, whether in the service of the State or of private individuals, are overwhelmed with secretarial work to which they devote all their spare time. Too little time thus remains for forest management, or the solution of questions of pure forestry. In the Austrian Forest Service marking trees for felling is one of the most

it duties of the Forest Superintendent. In the instruction of the Management of the Imperial Forests and Domains, special stress y laid upon this duty. Where the forester is overwhelmed with al work it is but natural that he should prefer the system which re- f him the least expenditure of time, and this is clear felling. The nents for management, also, are not favourable to the selection- The estimation of the yield of the selection-forest presents too great es, although owing to the work of Hufnagl, Tichy and other ex- e methods to be observed seem to have been clearly and indubit- forth. The mass and yield of an even-aged forest are much more lculated, and as all managers work more or less according to one or heme, and have usually very large tasks to accomplish, they natu- m their point of view prefer those systems of forestry which are 1 stands of the same age, and certainly by preference on clear felling)sequent artificial regeneration. Here, no doubt can arise as to the d increase of the stands, the stand charts give a clear picture of of the different stands, and estimates of the capability are quickly ily made.

is the calculators of net returns who least approve of the selection-)ecause it is absolutely impossible to strain it into mathematical Their calculations break down when applied to woods containing different ages, but especially in the case of the selection- forest, ors creep in whose importance cannot be estimated.

should therefore cause us no surprise if the selection-forest finds so 'ocates amongst the foresters of the present day. It is the system akes the greatest demands upon the forester, provides him with dif- uestions to settle and is a complete failure if practised superficially h insufficient insight.

t in spite of all opposition, the introduction or retention of the selec- stem is undoubtedly to be recommended where it is a question of nterrupted maintenance of a high crop, as in the cases of protection under servitude, small areas supplying forest dwellers with wood, or s' forests which supply the domestic needs of their owners.

ls in Switzerland that selection-forests are most prized; here the im- e of this system from the standpoint of rural economy is recognized lly appreciated. Quite independently of the important part played selection system in the case of protection forests, it is the high of the very well managed selection-forest which have won for it as'ic supporters, especially the Forestry Inspector of the Confedera- r. Fankhauser.

ave myself visited some of the Swiss selection-forests, notably those Canton Graubunden, and was delighted with their beauty and the th which they are managed. Excellent transport stations also are ting; as a rule these are used for alpine economy, as well as for ansport.

this connection we should do well to take Switzerland as our

Results of Drilling Manures in Hungary

by

COLOMAN KERPELY,

Director of the Agricultural Academy at Debreczen.

Until recently in Hungary chemical manures were generally spr by hand or by machines which distributed them very evenly over the surf of the soil; but the experiments made during the last ten years h shown that in Hungary, especially in the dry regions (first among wh is the great Alföld plain) articial manures, with the exception of nit of soda, are more certain in their action if they are applied before sow and at the same time buried to a depth of 5 to 6 inches.

Consequently, in 1909, when the distributor Record II, made at l oncz in Hungary, was adopted for drilling the manures and seeds togeth was natural that it should have been looked upon with distrust by far as being contrary to their fundamental principles of manuring. For machine deposits the manure and seed together in the same drill, on principle that more fertilising material is readily available to the del seedlings and promotes their rapid and vigorous growth. Unlike c distributors it does not deposit the manure first and then the seed possessing only one tube it supplies both at the same time to each co and is consequently of simpler construction and of much easier dra than machines with separate tubes and coulters for the seed and ma In fact, except for the weight of the manure box (built on Schlöer's sys it is not heavier than an ordinary seed drill, a point of considerable tical importance. Considering the following results of experiments, th no reason to believe that manure so applied has any effect on the ge ating power of the seeds, and no doubt remains as to the efficiency o method.

Two great advantages of this method are: that one-half of the qua of manure is enough to secure remunerative results, and the cost of wo is considerably reduced, as the machine Record II performs at the same the two operations of manuring and seeding. These economies them are sufficient to rouse the interest of Hungarian farmers, and experiment ried out to determine how far these advantages can be realised are sum ised in this article. They were commenced in 1909 and were carried o land in various parts of Hungary and continued during successive of varied character; the above-mentioned machine was almost es clu used. The results given below have been collected from those pub in the various agricultural journals of Hungary. They are divided three groups as follows:

1). Effect of manures in drills compared with unmanured plots.
2). Manure in drills compared with manure broadcasted.
3). Distribution of manures other than superphosphate, particularly of soda and 40 per cent. potash.

ie general poverty of Hungarian soils in phosphoric acid (owing to tended cultivation of cereals) favours a greater response to applica- f superphosphate; though there is frequently a need for nitrogenous tash manures, phosphatic manures are most commonly in use through- e country. This fact, along with the introduction of this distribu- ; done much in determining the value of drilling manures.

Experiments with Winter Cereals.

he results are summarised in Tables I, II and III.

Table I. — *Wheat.*

County	Soil	Quantity of superphosphate applied per acre		Increase in yield over control plots, per acre		Value of increase after deducting cost of manure, per acre	
		in drills	broadcasted	in drills	broadcasted	in drills	broadcasted
		lbs.	lbs.	lbs.	lbs.	£ s d	£ s d
Pest, Pozsony and Nograd (3 estates)	clay, humic clay	124-139	—	202-744	—	0 11 10 to 2 16 1	—
Komárom, Pest and Alsófehér (5 estates)	clay . .	109-117	—	434-496	—	1 12 1 to 1 17 6	—
	sandy humus . .	124-139	—	434-511	—		
Komárom and Alsófehér (3 estates)	clay . . , sandy humus . .	124-139	—	234-248	—	0 12 10 to 0 14 1	—
Nográd, Fejer, Pest, Szatmar, Arad Aranyos-Torda (8 estates)	clay . .	124 *	240 *	509	383	1 18 2	1 3 5

t of manure — in drills 4s 2d; broadcast, 8s 4d. The figures in this line represent averages.

TABLE II. — *Rye.*

Year	County	Soil	Quantity of superphosphate applied		Increase in yield over control plots		Value of in... after deducting ... of manure
			in drills	broad-casted	in drills	broad-casted	in drills
			lbs.	lbs.	lbs.	lbs.	£ s d
1909-10	Nográd, Fehér and Györ (3 estates)	clay	124-139	—	357-387	—	1 2 9 to 1 4 1
1910-11	Komárom and Fejér (3 estates)	sand	124	—	248	—	13 6
		clay	124	—	690	—	2 8 2
1911-12	Nográd, Fejér Zemplén Szatmár (5 estates)	clay loam	167	244	351	221	1 0 10

N. B. — The results of 1910-11 and 1911-12 represent averages.

These results show that with winter cereals, superphosphate applied in drills has given large increases in yield over the broadcasted as well as the unmanured plots, and that a small quantity of manure drilled in with the seed can produce as good or even better yields than a large quantity broadcasted. In several cases shown in Table III only half the quantity of manure applied in drills was required to produce equally and even slightly more paying results.

TABLE III.

District	Soil	Quantity of superphosphate applied, per acre		Increase in yield ... control plots, per ...	
		in drills	broadcasted	in drills	broadc...
		lbs.	lbs.	lbs.	lbs.
I. - *Winter Wheat.*					
Nográd	Clay	93	186	497	49...
Fejér	Humic-clay	116	232	744	75...
Arad	Clay	155	310	439	39...
II. - *Winter Rye.*					
Györ	Clay	101	202	694	7...

In other cases the best results were obtained by drilling quantities ıperphosphate exceeding half the dressing broadcasted.

Experiments with Spring Cereals.

These experiments were conducted with two-rowed brewing barley and . Experiments in Hungary have shown that in manuring spring als having a short vegetative period, it is necessary to apply the manures in advance of the sowing to obtain their full effect. It was therefore e expected that drilling the manures with the seed would give a negative lt.

1. *Two-rowed spring barley.* — The results of 1909 were obtained in district only, a clay soil in the county of Nograd. They are summar- in Table IV.

TABLE IV.

Manure				Increase over control plots	
292	lbs.	Superphosphate	broadcasted	544	lbs.
101	»	»	drilled.	653	»
147	»	»	»	653	»
194	»	»	»	601	»

In 1910, three estates (counties of Nográd, Pozsony and Pest) manured h 124 to 155 lbs. of superphosphate applied in drills gave an increased ld of 202 to 263 lbs. on loamy soil, and 496 to 883 lbs. on a humic y soil, making a net profit of 8*s* 4*d* to 11*s* 6*d* and £1 7*s* 7*d* to £2 13*s* 11*d* pectively.

In 1911 experiments were carried out on eleven estates to compare ; yields of unmanured plots with plots manured in drills, and drilling h broadcasting the manure. In two estates (in Komárom) on sandy hu- s, 124 lbs. of superphosphate applied in drills increased the yield of in by 216 lbs., and in another district (Kisküküllö) on a sandy soil, 155 . of superphosphate gave an increase of 635 lbs., or a net profit of from 11*d* to £1 13*s* 11*d*.

Table V shows the average increases obtained on 7 estates (Nográd, Ko- s, Nagyküküllö and Aranyos-Torda counties) on loam and humic clay ls.

TABLE V.

Manure				Increase in yield of grain over control plots	
202 to 232	lbs.	Superphosphate	broadcasted	124 to 611	lbs.
78	»	»	drilled	233 » 326	»
116	»	»	drilled	210 » 528	»
155	»	»	»	410 » 736	»

The results obtained on two estates have provided interesting compari- s of the influence of cultivation and seed time on the increase in yield duced by applying chemical manures broadcast and in drills.

The increases in the yield of barley over the control plots, sown at the end of April after spring cultivation, are as follows :

					Increase
232	lbs.	of	superphosphaie	broadcasted . . .	145 lbs.
116	»	»	»	drilled	456 »

Barley sown in the middle of March after autumn cultivation and harrowing in the spring gave the following increases :

				Increase	Value
232	lbs.	of superphosphate	broadcasted	611 lbs.	£1 12s 8d
116	»	»	drilled	582 »	£1 9s 10d
155	»	»	»	738 »	£2 4s 10d

These results show that artificials broadcasted, and still more than drilled, exerted a greater influence on barley sown at the beginning of spring on soil ploughed in the autumn. In 1912, on four estates (counties Komárom, Sáros and Aranyos-Torda) on clay and humic clay soils, the following results were obtained :.

				Increase	Value
232 lbs.	of superphosphate	broadcasted	294 lbs.	11s 2d
116 »	»	drilled	238 to 651 lbs.	11s 7d to £1 19s 1d

2. *Oats.* — Experiments conducted on ten estates have given the same results as those obtained with barley. Applications of 93, 116 and 124 lbs. of superphosphate in drills have produced greater increases than broadcasting 186 and 232 lbs. In this case also the time of cultivation of the soil and of sowing have considerable influence on the action of the manure applied in drills. Oats sown late (at the end of April) after spring cultivation gave the following increases :

					Increase
93	lbs.	of	superphosphate	in drills	115 lbs.
116	»	»	»	»	112 »

Whilst oats sown early (in the middle of March) after autumn cultivation gave the following :

					Increase
98	lbs.	of	superphosphate	in drills	181 lbs.
116	»	»	»	»	183 »

3. *Spring wheat.* — Comparative experiments were made only in 1911 on three estates (Kolozs and Szolnok-Doboka counties) on clay soil, with the following results :

		Increase
116 lbs. of superphosphate	in drills	191 to 208 lbs.
170 » »	»	574 »
232 » »	broadcasted	62 to 232 »

se results also show that in drilling manure, half the quantity broadcasted is not sufficient, and that the best results are obtained ying a larger quantity than this, namely 170 lbs.

e results of these experiments made between 1909 and 1912 may be ised as follows.

Superphosphate applied in the drills with the seed has no corrosive rious action on the germinating power of the seeds in either (1) or wet seasons (1912). Even quantities as large as 232 lbs. injurious action on germination. In fact the germination of the wn with manure is more rapid and uniform.

e corrosive action of superphosphate when drilled in, and the decrease ination and lower yield, were only observed when the pickled seeds ot sufficiently dried before sowing. Some experiments on barley s with mixtures of nitrate of soda and superphosphate have shown en with doses of 93 lbs. of nitrate and in direct contact with the rmination was not at all impaired.

The majority of experiments have shown that manuring in the drills profitable than broadcasting, because of the economy of the manure. le half the usual quantity of manure sown in this way is sufficient; re exceptions and it is necessary to determine the correct quantity h estate by comparative experiments.

nuring in the drill, however, does not produce better results in the year, but this is of little consequence, since it is in the best interests farmer to obtain his maximum yields in the first year, and it is not to repeat the application each year, especially with small quanti- the more so as it does not cost extra labour, for the same machine ed and manure together.

This method of manuring also gives considerable increases in the straw, which is a distinct advantage with the straw of spring cereals and oats) which is used as fodder.

In the dry season of 1911 the superiority of drilling in the super- ate with the seed was particularly evident and there appeared to cient moisture both for the germination of the grain and the decom- n of the manure.

Whenever no result was obtained by drilling the manure none was d by broadcasting it and every experiment successful with broad- was also successful with drilling the manure. Four years' experi- nder the most varied conditions of soil and climate have shown oil particularly responsive to dressings of superphosphate responds hen it is applied in drills.

Manuring in drills has also in most cases a beneficial effect on the of the grain, *i. e.* the weight per bushel.

Experiments on Sugar-Beets.

The best results have been obtained in these experiments. In m
cases sugar beets do not respond at all to artificial manures broadcas
but a small quantity drilled in with the seed is very effective. The ma
being readily available to the seedling, enables it to grow out of the dan
ous period quickly and become established with greater vigour than
broadcasted manure.

This was evident in the experiments of 1909-12 and farmers are un
mously agreed that sugar-beets manured in the drill germinate
quickly and uniformly and that their subsequent growth is more vigo
and resistant to drought than when they are manured broadcast.

The results in Table VI were obtained on six estates (Pozsony, Ne
Nográd and Csanád counties) on clay and humic clay soils.

Table VI.

Quantities of superphosphate	Increase in yield	Value of increa
302 lbs. broadcasted	775 to 4495 lbs.	— 1s 7d to 17s
93 to 108 » drilled	3100 » 4495 »	19s 10d » £1 1
155 » »	5425 » 6200 »	£1 19s 9d » £2 6

The following are the results obtained by using a mixture of
phosphate and nitrate of soda.

Manures	Increase in yield	V of i
116 lbs. of superphosphate + 46 lbs. of nitrate of soda in drills	9145 lbs.	£3
232 » » + 93 » » » broadcasted	3875 »	

The injurious effects of nitrate of soda on germination were only
able when it was applied in larger quantities than 93 lbs., in which case
vented uniform germination and diminished the yield.

in the county of Csanád on a humic clay soil it was found that the ion of 78 lbs. of 40 per cent. potash to the mixture of superphosphate nitrate of soda produced when drilled a quicker and more uniform ination than when the potash manure was broadcasted, and that rate applications of potash did not have an injurious effect on the ination of the grain when drilled with it.

Manuring in the drill does not decrease the proportion of sugar in the , but on the contrary in some cases it increases it. Similar results have been obtained with mangels. The seedlings of both plants are more tant to root disease (" Pied noir " or " Wurzelbrand ") when manured is way.

The undoubted success of these experiments both in the dry season)11 and in the wet year 1912 makes it very probabe that this system anuring in the drill will be generally adopted in agricultural practice.

SECOND PART.

ABSTRACTS

AGRICULTURAL INTELLIGENCE

GENERAL INFORMATION.

1230 – **Law of July 2, 1913, Encouraging the Replanting and Preservation of Private Forests in France.** — *Journal officiel de la République française*, Year 45, No. 181, pp. 5809-5810, and No. 274, p. 8911. Paris, July 6 and October 9, 1913.

Art. 1. — The undermentioned lands are to be administered by the Forest Office according to the provisions of the Code relating to woods belonging to public bodies:

1) Woods and forest belonging to Departments.

2) All forests, woods and lands reserved for planting belonging to recognized societies of public utility and approved mutual aid societies.

Art 2. — The second paragraph of article 11 of the law of July 1, 190 concerning deeds of partnership to be terminated as follows:

"Woods, forests and land to be planted may be acquired, either by purchase or gratuitiously".

Art. 3. — The Forestry Administration is empowered to take charg either wholly or in part, of the preservation and management of woo belonging to persons or societies, in consideration of an annual paym according to the terms of agreement, which shall be made for a period of less than ten years. Applications to be made to the Conservator Waters and Forests in the district in which the property is situated.

The provisions of articles 91, 97, 107 (§ 2), 108 and 109 (§1), relating woods belonging to public bodies, those of section 1 of chapter XI, wit the exception of paragraph 2 of article 169, those of paragraph 2 of artic 189, and those of section 1 of chapter XIII, to be applied to these wood

All agreements and sales not authorised by the forest administratio or not conforming to their conditions, effected by the proprietors or admin strators of these woods who have allowed to third parties rights of use have proceeded to cut timber, are declared null and void.

Art. 4. — A sum equivalent to the anticipated income of the fees of inistration paid by recognized societies of public utility, approved mutual societies, and by individuals and other societies, to be placed at the osal of the Forestry Administration in payment of the supplementary enses of administration.

Art. 5. — All acquisition of woods, forests and lands to be planted be worked according to the provisions of article 10 of the law of 7 20, 1895, and will be included in investments effected by means of local savings bank, provided that the total acquisitions shall not exceed tenth of the personal capital.

Art. 6. — The conditions of working of the present law will be deter-ed by an order of public administration.

- **The Agricultural and Forestry Colleges and Schools in Austria in the Scholastic Year 1912-13.** — *Land- und forstwirtschaftliche Unterrichtszeitung*, Year XXVII, Part I-II, pp. 55-107. Vienna, 1913.

The number of Agricultural and Forestry Colleges and Schools in Austria ing the scholastic 1912-1913 amounted, including the Brewing and tillery Schools, to 226. The new colleges and schools opened since the vious year included the Agricultural School (Mittelschule) at Kloster-ıdisch, 5 Agricultural Winter Schools, 2 Housekeeping Schools, the ıter Agricultural and Horticultural School at Schnobolin (Moravia), the Fruit-growing School at Wisowitz (Moravia).

The following Schools have been closed : the School of Agriculture and p-growing at Kloster-Hradisch, two Winter Schools, one Housekeeping ool and the Brewing School at Mödling.

The 226 schools include: 3 Colleges or divisions of Colleges, 3 Agri-tural and 1 Brewing Academy, 9 Agricultural and 5 Forestry Middle ools, 2 Technical Middle Schools for Vine and Fruit-growing and Hor-lture, 42 Agricultural Schools, *i. e.* Lower Agricultural Schools with ruction throughout the year, 91 Agricultural Winter Schools (19 of e also hold a summer housekeeping course), 11 Lower Grade Forestry ools, 4 Dairy Schools, 22 Housekeeping and Farm Schools, 30 Lower le Special Schools for horticulture, the cultivation of fruit, vines, tables, flax and hops, for the cultivation of meadows and for Alpine ning and beekeeping, 1 Brewing and 2 Distillery Schools. The accom-ying table gives the details respecting the number of students and hers, and of the length of the courses in the single schools or groups chools during the scholastic year 1912-13.

Colleges and Schools	Length of Course	No. of the Regular Staff	No. of Outside Teachers	Actual number of students in the beginning of March 1913
I. — *Colleges.*				
Royal Imperial Agricultural College in Vienna	4 years	63	26	1 [illegible]
Agricultural Section of the Cracow University	4 »	8	14	39[illegible]
Agricultural Section of the Bohemian Technical College at Prague.	4 »	21	18	17[illegible]
II. — *Agricultural Academies.*				
Tabor (Bohemia)	2 »	10	8	14[illegible]
Tetschen-Liebwerd (Bohemia)	2 »	27	2	6[illegible]
Dublany (Galicia)	3 »	15	9	13[illegible]
Brewing Academy in Vienna	2 »	4	19	17
III. — *Agricultural Middle Schools.*				
Agricultural at:				
Mödling	3 »	6	8	13
Chrudim	3 »	14	5	22[illegible]
Kaaden	3 »	12	8	22[illegible]
Randnitz a. E.	3 »	14	4	22[illegible]
Kloster-Hradisch.	2 »	6	1	6[illegible]
Neutitschein	3 »	6	5	8[illegible]
Prerau	3 »	9	4	15[illegible]
Ober-Hermsdorf	3 »	9	4	5[illegible]
Czernichów	3 »	10	4	6[illegible]
Forestry at:				
Bruck a. d. Mur.	3 »	5	5	4[illegible]
Pisek	2 »	9	5	7[illegible]
Reichstadt	3 »	8	1	9[illegible]
Mährisch Weisskirchen	3 »	8	3	7[illegible]
Lemberg	3 »	7	9	8[illegible]
Higher School for Vine and Fruit-growing at Klosterneuburg	3 »	7	11	4
Higher Fruit-growing and Horticultural School at Eisgrub	3 »	4	6	5
IV. — *Lower Schools.*				
42 Agricultural Schools (1 for women) . .	2–3 »	175	194	1 [illegible]
91 Agricultural Winter Schools	1–2 »	251	610	3 [illegible]
11 Forestry and Woodcraft Schools. . . .	1–2 »	26	39	3[illegible]
4 Dairy Schools	1 (one 2) »	19	9	6[illegible]
22 Housekeeping and Farming Schools . .	1–2 years	100	63	
30 Special Schools for Gardening, the Cultivation of Fruit, Vines, Vegetables, Flax, Hops, Meadows, and for Alpine Farming and Bee-keeping.	1–3 »	91	90	8[illegible]
3 Brewing and Distilling Schools	1 year	8	18	[illegible]

chemes for the Reform of Horticultural Education in Austria. —
ENNER, KURT in *Land- und forstwirtschaftliche Unterrichtszeitung*, Year XXVII,
I-II, pp. 34-41. Vienna, 1913.

Imperial and Royal Horticultural Association of Vienna intends to
t a thorough reform of the system of horticultural education. The
the Society and the direction of their efforts are set forth in this
y its Secretary General.

ording to this scheme, the first step will be the establishment of
ce-schools, of which four are already founded. These are schools
g of two classes in which instruction is given for nine hours weekly
the six winter months. The curriculum includes: 1) Technical
mercial instruction (the solution of commercial problems, arith-
ook-keeping); 2) Civil law; 3) Drawing; 4) Horticulture (garden-
t-growing, land measurement, plant diseases, natural history, seed
; 5) Instruction in general subjects.

gardener must look to the under-gardeners' schools for the continu-
his education. These also consist of two classes. Admission
ed on the production of a leaving certificate from the apprentice-
or of a certificate showing that the candidate has completed the
f instruction. In these schools instruction is given in 18 hours of
a week during the six winter months. The curriculum includes:
man language, geography and civil law, arithmetic and geometry,
ry, mineralogy and zoology, book-keeping and correspondence, bot-
seed-growing, gardening, fruit-growing, plant diseases, landscape
g, garden history, field measuring and management.

writer considers that the travelling grant given to young students
ng the apprentice-school is an important educational factor. By this
hey are enabled to travel and also to work abroad. Opportunity
lso be afforded from time to time to the educated, practical gardener
e acquainted wih the results of the latest investigations and re-
This is effected by the "gardening weeks" and gardening courses.
st Austrian Gardening Week" was held in Vienna from the 9th
th of December 1912. The great interest shown in gardening
s induced the Council of the Imperial and Royal Horticultural
n to make this gardening week into a permanent institution in
ls of the different States of the Empire.

e opinion of the writer, the foundation of half-yearly winter schools
ole day attendance) would offer a second opportunity to young
for the prosecution of their studies. These, however, would
stablished in gardening centres where special crops are cultivated.
lscape gardeners and head-gardeners receive suitable instruction
ultural Colleges ("höhere Gartenbauschule"). As the necessary
certificate of one year's practical work by no means ensures that
date possesses the required practical experience, the writer thinks
be advisable that the curriculum of the gardening school should
year's practical preliminary course, and that the instruction given
e last years should be specialized. It would also be very advanta-

geous if a large market garden were attached to such a school where student could also be instructed in the commercial side of gardening. the case of the landscape gardeners, it is very useful and even neces that they should have the opportunity of completing their educatio attending a one year's course at the School of Applied Arts. An inte of two years should elapse between leaving the Horticultural Colleg entering this School.

1233 – **Importance, Scope and Carrying out of Practical Work in Agricu Schools.** — 1) SCHNEIDER, FRITZ; 2) GROSS, ALOIS; 3) MARESCH, HEINRICH in *und forstwirtschaftliche Unterrichtszeitung*, Year XXVII, Part 1-2, pp. 18-33. Vienna

The writers deal with the following points :

1. *Practical training in middle agricultural schools.* — *a*) Necessi practical knowledge for pupils leaving these schools ; *b*) advantages an cessity of a preparation on practical lines before admission ; *c*) scop carrying out of practical work in the middle agricultural school at N schein in the three years' course.

2. *Practical training in farm schools.* — *a*) Advantages and necess having a farm attached to the school ; *b*) scope and carrying out of pra work at the school of agriculture and flax-growing at Mährisch-Schö in summer (field work, cultivation and preparation of flax, animal hus ry, dairying, fruit and vegetable growing, forestry) and during the w (manual work, including wheelwright's work, saddlery and basket

3. *Practical work in winter agricultural schools.* — *a*) Manual, inc basket work, woodwork and saddlery ; *b*) practical work in the school and experimental fields.

1234 – **Proposals for the Unification of the System of Instruction in the Agricultural Schools in Austria.** — JACHIMOWICZ, FRANZ in *Land- und fo schaftliche Unterrichtszeitung*, Year XXVII, Part I-II, pp. 42-54. Vienna, 1913.

The writer complains of the inefficiency and the disadvantages o existing system of dividing the Agricultural Schools into one-year sc two-year schools, and winter schools, and proposes that all these (ent educational establishments should be transformed, according to a system, into schools with three half-years with an optional (practical) sum half-year, and occasional practical spring and summer courses. He fu treats of the division among the teachers of different subjects, th tribution of the subjects over the three half-years and the method instruction and examination to be adopted.

1235 – **Agricultural and Forestry Colleges in Prussia during the Summe year of 1913.** — *Zentralblatt der Preussischen Landwirtschafts-Kammern*, Y No. 36, p. 241. Berlin, September 8, 1913.

The agricultural colleges of Prussia were attended during the su half-year of 1913 by 963 students, of whom 622 continued from pre half-years. The new students entered were 171 and there were 170 un culated ones.

At the Berlin Agricultural College the students were 500 (78 new tered and 155 unmatriculated), while the agricultural academy of

elsdorf had altogether 493 students (93 newly entered and 15 unmatri-ed). As agricultural students, the total entered was 511 (233 at n and 278 at Bonn); 308 were entered as land surveyors and rural eers (Geodäten und Kulturtechniker), namely 129 at Berlin and 179 nn. In the agricultural technical section (fermentation industries) were 79 students at Berlin. The lectures at the Berlin college were ded also by 252 students from the Veterinary College, and 113 stu-from Berlin University followed the common courses of the Agricul-College and of the University.

The Veterinary Colleges were attended by a total of 749 students, om 397 entered at the Berlin Veterinary College and 352 at the Hanover inary College. In the first-named there were 310 students from pre-g half years, 72 were new and 15 were unmatriculated. In Hanover orresponding figures were 262, 83 and 7.

The two Forestry Colleges have between them 138 students, namely Eberswald and 78 at Münden. Of the former 67 are from the preceding es and 3 newly entered, while the latter has 64 old students, 12 newly ed and 2 unmatriculated.

- **Farm-Management Course at the Agricultural Academy of Bonn-Poppelsdorf.** — *Zentralblatt der Preussischen Landwirtschaftskammern*, Year 12, No. 36; 243. Berlin, September 8, 1913.

The agricultural academy of Bonn-Poppelsdorf is starting a course rm management and cooperation in the winter half-year 1913-14; it rs two halves and leads up to a special examination. It is designed to le students to acquire a more thorough knowledge of social economy, and administration, and the theory of cooperation and assurance, as ed to agriculture.

- **Agricultural Shows.**

Argentine Republic.

1914. Dec. 15 - April 15, Córdoba. — Show of fruit and objects connected therewith, bee-keeping, silkworm-rearing and vegetable fibres. Address to the president of the « Comisión organizadora », calle Independencia No. 159, Departamento de Agricultura y Ganadería de la Provincia de Córdoba.

Australia: New South Wales.

The following shows will be held:

Jan. 29-31. — Wollongong Agricultural, Horticultural and Industrial Association. — W. J. Cochrane, Sec.

Feb. 4-5. — Berry Agr. Assoc. — S. G. Banfield, Sec.

Feb. 10-11. — Dorrigo Agr., Hort. and Ind. Soc. — W. R. Colwell, Sec.

Feb. 11-12. — Moruya Agr. and Pastoral Soc. — H. P. Jeffery, Sec.

Feb. 11-12. — Alstonville Agr. Soc. — C. D. Mc Intyre, Sec.

Feb. 17-19. — Guyra Pastoral, Agr. and Hort. Soc. — P. N. Stevenson, Sec.

Feb. 18-19. — Gunning Pastoral, Hort. and Ind. Soc. — J. R. Turner, Sec.

Feb. 24-25. — Dapto Agr. and Hort. Soc. — J. H. Lindsay, Sec.

Feb. 25-27. — Inverell Pastoral and Agr. Assoc. — J. Mc Ilveen, Sec.

March 3-5. — Uralla Agr. Assoc. — H. W. Vincent, Sec.

March 3-5. — Tenterfield Pastoral, Agr. and M. Soc. — F. W. Hoskin, Sec.

March 4-5. — Tumut Agr. and Pastoral Assoc. — T. E. Wilkinson, Sec.

March 5-6. — Oberon Agr., Hort. and Pastoral Assoc. — M. J. Looby, Sec.
March 11-12. — Coramba District Pastoral, Agr. and Hort. Soc. — H. E. Hindma Sec.
March 11-13. — Tumbarumba and Upper Murray Pastoral and Agr. Assoc. — J. Figures, Sec.
March 17-18. — Gundagai Pastoral and Agr. Soc. — A. Elworthy, Sec.
March 17-19. — Bangalow Agr. and Ind. Soc. — W. H. Reading, Sec.
March 18-19. — Cobargo Agr., Pastoral and Hort. Soc. — T. Kennelly, Sec.
March 18-20. — Camden Agr., Hort. and Ind. Soc. — C. A. Thompson, Sec.
March 19-21. — Goulburn Agr., Pastoral and Hort. Soc. — G. G. Harris, Sec.
March 24-26. — Mudgee Agr., Pastoral, Hort. and Ind. Assoc. — P. J. Griffin, Sec.
March 24-26. — Narrabri Pastoral, Agr. and Hort. Soc. — D. J. Bridge, Sec.
March 25-26. — Blayney Agr. and Pastoral Assoc. — H. R. Woolley, Sec.
March 25-27. — Macleay Agr., Hort. and Ind. Assoc. — E. Weeks, Sec.
March 26-27. — Crookwell Agr., Hort. and Pastoral Assoc. — H. P. Levy, Sec.
March 31 - April 1. — Luddenham Agr. and Hort. Soc. — F. C. Emery, Sec.
April 1-2. — Cooma Pastoral and Hort. Assoc. — C. J. Walmsley, Sec.
April 22-24. — Bathurst Agr., Hort. and Pastoral Assoc. — J. Bain, Sec.
April 22-25. — Hunter River Agr. and Hort. Assoc., West Maitland. — E. H. Fou tain, Sec.
April 28-30. — Tamworth Pastoral and Agr. Assoc. — J. R. Wood, Sec.
April 29 - May 1. — Orange Pastoral and Agr. Assoc. — W. J. I. Nancarrow, Sec.
May 6-8. — Clarence Pastoral and Agr. Soc., Grafton. — G. N. Small, Sec.
May 7-9. — Hawkesburry District Agr. Assoc., Windsor. — H. S. Johnston, Sec.
May 12-13. — Lower Clarence Agr. Soc., Mac Lean. — J. Mc Pherson, Sec.

Belgium.

1913. Dec. 13-15. Jemeppe-sur-Meuse (Liège). — See p. 1354, *B.* Sept. 1913.

1914. Jan. 17-19. Verviers (Liège). — Poultry show, organized by the "Société ornitholog de l'Est de la Belgique".
Feb. 21-24. Brussels. — International poultry show, organized by the "Société Ro des Aviculteurs Belges".

Cuba.

1914. Feb. 15-22. Havana, Quinta de los Molinos. — Poultry show, organized by the ". ciación de Avicultura Cubana".

France.

1913 Dec. Douai (Nord). — National poultry show, organized by the "Club des Aviculte et Eleveurs amateurs du Douaisis". Address to E. Mathieu, Gen. Sec., Ro Warendin, Nord.
Dec. 10-15. Moulins (Allier). — International poultry show, organized by the "Soci des Aviculteurs et Apiculteurs du Bourbonnais et du Centre". Address to M. H ron, 36 rue de Bourgogne, Moulins, or to the general secretary of the society.
Dec. 17. Houdan (Seine-et-Oise). — Seventh show of live fat poultry and dead geese. Address to "Siège social du Houdan-Faverolles", 45 Grande-Rue, Houd

Germany.

1914. Feb. 7-9. Leipzig. — Rabbit show organized by the "Allgemeine Kaninchen-Zucht Verein für Leipzig und Umgebung."
Oct. 4-5. Hamburg. — Fourth fat stock show, organised by the Chamber of Agricult of the Province of Schleswig-Holstein. It will include five sections: 1) Live sto (cattle, pigs, sheep); 2) carcases (competition); 3) stock fattened for definite purpos 4) breeding stock belonging to exhibitors of fat stock; 5) objects and scientific and

concerning the production, trade and utilization of stock slaughtered. Address to the offices, Kampfstrasse 46, Hamburg.

ngary

ec. 5-8. Budapest. — National poultry show organized by the National Society of Poultry Breeders.

ion of South Africa.

ptchefstroom (Transvaal) and Middelburg (Cape). — Trials of tractor ploughs will be arranged by the South African Government.

eb. 24. Graaf Reinet (Cape). — The Midland Agricultural Society will hold a tractor-ploughing competition in connection with its annual show.

larch 6. Cradock (Cape). — Field trials for furrow ploughs, organized by the Cradock Agricultural Society. George H. Brynes, Sec.

Agricultural Congresses.

stria.

ec. 19-20. Vienna. — Fourth meeting and general assembly of the "Oesterreichische Obstbau- und Pomologen-Gesellschaft" (Austrian Fruitgrowers' Association).

ited Kingdom.

'ol. — With reference to the third International Congress of Tropical Agriculture (see *B.* Sept. 1913, No. 1238), address to the Organizing Secretaries, Imperial Institute, London S. W.

CROPS AND CULTIVATION.

Comparative Researches upon the Cohesion of Different Kinds of Soils.

PUCHNER, H. in *Internationale Mitteilungen für Bodenkunde*, Vol. III, Part 2-3, . 141-239 + figs. 2. Berlin, 1913.

otwithstanding the importance of the cohesion of the soil for the va- operations of tillage, and the researches of Schubler, Haberlandt, d, Atterberg and the writer upon the subject, this property of the soil least known and the least investigated.

he writer is of opinion that the best criterium for valuing the cohesion il is afforded by its resistance to crushing pressure, which hitherto een erroneously thought by agrologists to be absolute. In order ermine this resistance, the writer considers the method proposed by the best. It consists in exerting the acquired pressure by means of on cylinders prepared with the fine earth (less than 3 mm. according lejeff) to be examined. These cylinders are 3 cm. high and 2 cm. in ter. The breaking weight is given in grams. The writer insists the essential condition that the structure and composition of these ers be as uniform and homogeneous as possible, and of the absolutely rical shape of the sample of earth during the tests.

1 this manner the writer has determined the cohesion of 265 samples taken in several parts of Bavaria at varying depths from 0 to 8 and from 20 to 40 and 48 inches.

1 general, cohesion is found to vary very much; in most cases it is less surface layers than in the deeper ones. The following table gives a of the various degrees and limits of such variability, in which the

several degrees of cohesion determined for the superficial layers or th depth of about 2ft. 2 in. are grouped together.

Cases	Cohesion according to Puchner, in grams
22.	over 20 000
30.	10 000 to 20 000
57.	5 000 » 10 000
63.	2 000 » 5 000
34.	500 » 2 000
59.	0 » 500

From the comparative study of the other properties of the soils mined, the writer deduces the eventual influence of mechanical and ph cal structure, of chemical composition and of biological factors upon cohesion of soils, reaching the following principal conclusions, taking account the fact that the determinations of cohesion were made on perfe dry material.

I. The cohesion of a soil, other conditions being equal, probably creases the less sand (from 0.25 to 3 mm.) is contained in the fine earth the more uniformily the other parts (from less than 0.0015 to 0.25 m are mixed together in equal proportions.

II. The cohesion of a soil may also vary not only according to t physical properties of its constituent parts, but also according to che cal and biological conditions.

As for the application of these results to practical work, the writer pointed out that in stiff soils cohesion diminishes gradually with an increa of moisture, whilst with loose soils the reverse takes place, with this diff ence: that coarse-grained loose soils show cohesion only with a maximum moisture, whilst in those possessing a fine texture cohesion increases w moisture up to a certain point and then diminishes. Consequently t cohesion indices obtained as above must be increased when they are lo and diminished when they are high, in order to get data for judging s naturally moist.

The resistance of the soil at a given degree of moisture remains to determined. The writer remarks that though the farmer is anxious till the soil when it is easiest to work, that is, most frequently, when mod ately moist, nevertheless a closer knowledge of the factors determi cohesion may lead to the discovery of other means of reducing the cohes of a soil in medium conditions of moisture and thus rendering it easier work.

. **The Bacterial Activity of the Soil in Relation to some of its Physical roperties.** – 1. RAHN, O. (Agricultural Experiment Station, Eart Lansing, Michigan.) ie Bakterientätigkeit im Boden als Funktion von Korngrösse und Wassergehalt. — *:entralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten, II. Abt.*, Vol. 35, lo. 17-19, pp. 429-465 + fig. 1. Jena, October 30, 1912. — 2. ID. (Bacteriological aboratory of the University of Wisconsin). Die Bakterientätigkeit im Boden als unktion der Nahrungskonzentration und der unlöslichen organischen Substanz. — *bid.*, Vol. 38, No. 19-20, pp. 484-494. Jena, August 9, 1913.

n order to determine the influence of the physical properties of the soil icterial activity, pure cultures of *Bacillus mycoides* and other aerobic ria were grown in a mixture of quar z sand, peptone and water, and in allel series of mixtures containing cellulose. The production of am- a was taken as the index of bacterial activity. For studying anaero- acteria comparative cultures of *Bacillus lactis acidi* were made in mix- of milk and sand and their activity measured by the quantity of acid by bacterial counts.

The conclusions vary according to the method of comparison adopted. ated in percentages of dry soil, as is custumary in soil bacteriology, uld appear that the bacteria develop more readily in sand moderately (20 to 25 per cent. water); but estimated in terms of the peptone solu- ammonification is more rapid in a medium containing only 10 per cent. ter. Thus the results vary considerably according to whether the pro- on of peptone is calculated in terms of soil or solution in water. Since griculturist is concerned only with the quantity of available nutritive ances present in the soil, it is necessary to determine the intensity cterial activity by comparing cultures equal in quantity and strength tritive substances.

n culture of *B. mycoides* the exchange of oxygen is considerably greater the growth of bacteria more rapid in sand cultures than in cul- prepared in tubes or flasks. The exchange of oxygen between the ases and the liquid depends upon the amount of oxygen present soil gases and the surface exposed to the air. The surface area nit of liquid is in inverse proportion to the square of the diameter soil particles and to the amount of liquid in the soil. The amount ygen in the air of the soil depends upon the aeration, which nost proportional to the square of the diameter of the particles. ate of decomposition is proportional to the thinness of the film of ire up to a certain limit, extremely attenuated films retarding decom- on. The optimum thickness of water films for *B. mycoides* is about 20 to This thickness was obtained by using sand of 1 mm. diameter with lity of 10 per cent. In arable soils in which the diameter of the par- does net exceed 0.1 mm., a humidity of 50 per cent. is necessary in to obtain the thickest film; so that aerobic bacteria will never find st condition of growth in ordinary soils.

rovided that the concentration of the nutritive substance is constant, d of the decomposition in the case of *B. mycoides* is always the same, only the rate of decomposition is modified by the supply of oxygen. other bacteria this limit varies considerably.

Anaerobic bacteria, such as *B. lactis acidi*, follow the same principle that is to say their growth depends chiefly on the thickness of the film water.

Lastly, the physical effect of undecomposed organic matter was c tained by adding filter paper or peaty matter. In fairly dry media or soi cellulose causes a decrease in the formation of ammonia owing to the wit drawal of some of the available moisture. In moist sand cultures, on t contrary, the addition of cellulose increases ammonification, probab owing to the separation of the particles and the increase in aeration.

1241 – **The Reawakening of the Soil.** MUNTZ, A. and GAUDECHON, H. in *Annales de Science Agronomique*, Year 30, No. 1, pp. 1-15. Paris, July 1913.

The sudden outburst of life in the soil which occurs at the end of th winter with the first rise of temperature is a well-marked phenomenon and the writers have already alluded to it as the " reawakening of the soil. It would naturally be expected that this process should be connected wit an increased biological activity, of which the production of nitrates is on of the most palpable and characteristic effects ; the writers had grou for believing that the nitrifying organisms, at that period of the year, through a phase of intense activity which declines after a short time, a is due not simply to the rise in temperature, but rather to a predilecti for a definite period of the year, to a kind of racial habit ; to investig this question they undertook the following set of experiments.

In 1910, during the period from February to June samples of soil we taken at fornightly intervals, their nitrate content was determined, an they were seeded into pots of soil (sterilized at 100° C.) and of leaf mou (sterilized in an autoclave at 100 - 102° C. for 3 hrs.). The pots contain 1.1 kg. of soil, or 375 gms. of leaf mould, to which had been added 0.2 p cent. and 0.3 per cent. respectively of ammonium sulphate ; after bei inoculated with 20 gms. of the " active " soil, they were incubated at a C., and their moisture content was kept constant by the addition of ster lized water. Their contents were sampled once a fortnight and analys for nitrates, and the inactivity of the uninoculated sterilized soil and le mould was checked by one pot of each material which received no " active soil and in which the nitrate content was practically constant throughou the experiments. The samples of the " culture " soil were drawn from piece of open ground covered over with a large tin basin to prev washing by rain.

In 1911 a second series of experiments was carried out under simi conditions, except that the " active " soil samples were drawn from a blo of soil of 7 kg., which was taken from the field in the early part of Februa and subsequently kept at a constant temperature of from 0° to 2° C.; a further that each time the pots were sampled, sufficient ammonium sulphat was added to bring their content up to 0.2 per cent. or 0.3 per cent. acc as the case might be.

The data of the samples used and the results of the two season shown in the accompanying tables.

"Active" soil samples.

1910			1911		
of sampling	Temp. of soil 4 in. deep.	Nitrates: Nitrogen in mgm. per kg. of dry soil	Date of sampling	Temp. of soil.	Nitrates: Nitrogen in mgm. per kg. of dry soil.
18 . . .	4°C	3.8	Feb. 14 . . .	0° — 2C	12
3 . . .	5°C	6.0	» 28 . . .	»	12
18 . . .	7°C	6.2	March 14 . . .	»	15
2 . . .	12°C	6.2	» 28 . . .	»	14
18 . . .	9°C	6.2	April 11 . . .	»	15
2 . . .	10°C	12.5	» 25 . . .	»	13
17 . . .	16°C	12.0	May 9 . . .	»	22
6 . . .	20°C	12.5	» 23 . . .	»	17
13 . . .	16°C	12.0			

Soil or leaf mould from pots.

of Inoculation	Nitrates (as Nitrogen in mgm. per kg. dry soil) formed			
	In soil		In leaf mould	
	during 2nd fortnight after inoculation	during 3rd fortnight after inoculation	during 2nd fortnight after inoculation	during 3rd fortnight after inoculation
1910.				
8				
0	9	40	129	—
3	138	249	236	—
18	300	294	381	—
2	108	333	416	—
18	208	191	454	—
2	206	141	125	—
17	—	—	58	—
1911.				
14	144	128	129	1 052
28	64	251	355	959
14	50	420	707	1 820
28	291	243	1 704	234
11	406	196	701	353
25	388	92	454	315
9	265	179	270	1 242
23	253	325	1 019	937

In the soil the formation of nitrates is not so rapid as in the leaf mo so that in the former medium the 3rd fortnight after inoculation forms best period of comparison, while in the leaf mould nitrification is also sufficiently active during the 2nd fortnight. In both years and in both m there was demonstrated a period of maximum activity for the nitrifi organisms corresponding to the time when the so-called reawakenin the soil occurs in the district (Paris). The activity could not be attributed variation in temperature, as the pots of soil and of leaf mould were all m tained at a constant temperature, and as during the second year this tor was also eliminated from the soil used for inoculation. The period maximum activity was followed by a period of reduced nitrate forma which persisted a certain length of time, and though later the ferme tion again increased, it never became as intense as during the first outb in the early spring.

1242 – **Studies in Bacteriological Analysis of Indian Soils: No. 1,** 1910-11 — HUTCHINSON, C. M. (Imperial Agricultural Bacteriologist, Pusa). — *Memoirs o Department of Agriculture in India, Bacteriological Series,* Vol. I, No. 1, pp. 65, fig plates VI, diagr. II. Calcutta, November 1912.

The writer has made thorough preliminary investigations into the b teriology of certain Indian soils. A large part of the present paper is oc pied with a discussion of comparative experiments on the methods to used in estimating the numbers of bacteria present and their activity, es cially in the changes of nitrogen under various conditions.

In an investigation of the so-called " weathering " of soils by repeat ploughing in the hot dry season preceding the spring rains, it was found th the maximum temperature reached by the top quarter inch was 60° Artificial weathering was therefore effected by exposing soil to the he and light of a Nernst lamp for 8 hours daily for a week at such a distan that the maximum temperature at the surface was 60° C. The resul showed that the number of bacteria was considerably reduced and th all but the sporing forms of the *subtilis* group (*B. mycoides, B. subtil B. mesentericus*) were eliminated from the first inch of soil. It was foun that the nitrifying power of the soil was not destroyed or altered b " weathering ", which the writer explains as due to reinfection of the su face soil from the lower layers.

The soils were further examined for the presence of protozoa by seedi into hay infusion ; two types of protozoa occurred (together in some case none were found between November and May. These two types were d troyed at 60° C. but not at 55° C. As, however, they were found in a Pu soil in May, just after the " weathering " operation had taken place, does not seem likely that the effectiveness of this operation can depend their elimination.

Experiments on the effect of various forms of partial steilization anaerobic and aerobic bacteria showed that in general the former suffer more severely than the latter. Artificial " weathering " at 55° C. for days eliminated all anaerobic organisms capable of developing on ag plates.

n conclusion, the writer suggests that an important result of weather-
which the top 9 inches of soil become practically air-dry, may be
p bacterial action and so conserve unchanged the organic matter
has not been previously decomposed ; in other words, it would form
hod of avoiding too rapid decomposition of organic manures, an effect
may be valuable under the high temperatures prevailing in India.

. **The Injurious Effects of Large Doses of Lime on Moor Soils.** — DENSCH, A. *Mitteilungen über die Arbeiten der Moor Versuchs-Station in Bremen*, Fifth Report, 331-352. Berlin, 1913. (1)

)ne of the fundamental measures adopted in the improvement of
s is liming ; it has, however, frequently been observed that excessive
:ations of lime are injurious, so that now not more than 1800 lbs.
cre are given to arable land, whilst pastures and meadows, being less
ptible, may be given 3600 to 4000 lbs. per acre (2).

The causes of this injurious effect are not yet well known. The writer
specially studied, in a series of laboratory researches, the behaviour
trogenous compounds in similar conditions, and has arrived at the fol-
ig conclusions :

I. The cause of the injury due to heavy liming on moor soil is connected
the nitrogen question.

II. The transformations of nitrogen in moor soils are essentially
ical, but a concurring bacterial activity is not out of the question.

III. In such moor soils, both limed and unlimed, losses of nitrogen,
a dressing with nitrate, are observed. On the intensity of such loss
does not appear to exert a determined influence ; these losses lower
tilization of the nitrogen but do not cause an absolute deficiency
s element.

IV. Under certain conditions an active leaching out of nitrate from peaty
that have been limed may cause considerable losses, which, however,
mited to cases of exceedingly unfavourable weather.

V. In decomposing moor soil nitrate undergoes a partial reduction to
nia and this to a great extent when the soil has been heavily limed.
termediate product nitrous acid may be formed ; this, however, may
in a fair length of time in the soil.

VI. It is highly probable that this formation of nitrites is one of the
rring causes of the injurious effects hitherto observed ; of course
ut excluding other possible factors.

VII. Besides the nitrites, probably some nitro or nitroso compounds
rmed, and it is not impossible that they also may be injurious to
s.

Lastly, in order to avoid the reduction of nitric nitrogen an energetic
of the soil is recommended, so as to favour an active oxidation of the
en compounds.

(*Ed.*)

See No 345, *B.* April 1913.
See above: BERSCH, « Moor Cultivation in Austria », p. 1675.

1244 – **The Residual Nitrogen from Green Manure in Sandy Soil as determined by Vegetation Experiments.** — VON SEELHORST, C. etc. – *Arbeiten Deutschen Landwirtschafts-Gesellschaft*, Part 241, pp. 147 + 19 diagrams. Berlin,

Practical experience has shown that, in sandy soils, the nitrogen duced with green manures, though often considerable in amount, appe to remain wholly, or nearly wholly, unutilized.

This may be due to:

a) leaching;

b) losses due to denitrification and the liberation of ammonia the air;

c) the solubility of organic residues;

d) the fixation of nitrogen in an albuminoid form. The last cau must, by the fact of the scanty utilization itself, be excluded; there th remain the three other causes, which have been the object of the expe ments discussed.

These experiments were carried out in boxes 10 feet square and 6 in. in height. They were filled with heath-sand, resting upon a laye pebbles and river-sand, and covered by a little heath-humus; a total 4349 lbs. of dry substance with about 1.17 lb. of nitrogen. The final scheme of the experiments is given in Table I.

The manure consisted of 40 gms. of 40 per cent. potash salts and 400 of superphosphate per box, except in the case of No. 14; all the boxes were inoculated with lupin-soil.

The final balance of nitrogen is shown by Table II.

These complete data, which confirm the partial data, permit of the statements of general practical importance being made.

The amount of nitrogen yielded by the boxes planted with cereals less than that yielded by the boxes planted with potatoes; on the other hand, the nitrogen content of the cereal crops is greater than that of the tubers, the difference being due to the fact that the boxes containing potatoes lose more water by drainage than those planted with cereals. Further, the utilisation of nitrogen was minimum when the green manure was applied early, while it was perceptible when this was done late. In calculating the utilization of nitrate of soda per year and per and taking it on an average as 55 per cent., we have for boxes 1, 7, 14 and 8, the following figures respectively: 1.7, 1.6, 2.2 and 2.4 gms.

Most of the unused nitrogen is thus carried off by the drainage water; leaching is less in the case of cultures of cereals than in those of potatoes, which proves that the latter require less water, and therefore more water drains off; nevertheless, in the case of late potatoes, the loss can be more than In all cases, the losses by drainage were larger with autumn green manure than with that spread in the spring; this was especially true for potatoes for during the slow developement of the latter, the green manure retains together with the nitrogen, a considerable amount of water. Thus the nitrogen content of the crops was always larger with spring than with autumn green manure. As a rule, the late use of green manure is of distinct advantage, especially for hoed crops.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1904–07	Green manure of blue lupins (1907 peas)												1904 Barley	1904 Fallow
	Dug in deep						Dug in superficially							
	Spring		Autumn				Spring		Autumn					
1905–08	Potatoes	Barley	Potatoes	Barley	Potatoes	Rye	Potatoes	Barley	Potatoes	Rye	Potatoes	Rye	Rye	Fallow
1908–09	Rye													Fallow
1909–10	Italian Rye Grass													Fallow
1910	Buckwheat													Fallow

TABLE II. — *Balance of nitrogen.*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Nitrogen of the crops:														
1904-07 . . . . . gm.	17.966	18.835	10.413	10.408	9.282	9.371	17.794	19.292	10.063	10.964	9.089	10.683	9.452	—
1908-10 . . . . . »	6.727	8.563	5.985	7.233	6.415	6.374	6.694	9.556	6.995	7.460	5.837	7.528	5.472	—
Total . . gm.	24.693	27.398	16.398	17.641	15.697	15.745	24.488	28.848	17.058	18.424	14.926	18.211	14.924	—
Nitrogen of the drainage water:														
1904-07 . . . . . gm.	20.169	13.573	35.350	23.799	34.544	26.428	21.702	13.608	34.791	23.930	33.039	24.051	9.040	22.897
1908-10 . . . . . »	8.687	8.860	7.696	6.525	7.959	8.505	9.610	8.083	8.740	6.978	7.775	6.772	3.534	5.105
Total . . gm.	28.856	22.433	43.046	32.324	42.503	34.933	31.312	21.691	43.531	30.908	40.814	30.823	12.574	27.902
Total nitrogen of crops and of drainage water. gm.	53.549	49.831	59.444	49.965	58.200	50.678	55.800	50.530	60.589	49.332	55.740	49.034	27.498	27.902
Nitrogen of green manure »	49.762	54.840	41.308	42.732	40.341	35.169	55.259	55.150	42.175	36.088	37.110	35.961	—	—
Residuum, October 1, 1910 gm.	— 3.787	+ 5.009	— 18.136	— 7.233	— 17.359	— 15.509	— 2.541	+ 4.611	— 18.414	— 13.244	— 18.630	— 13.073	— 27.498	— 27.902

TABLE III. — *Amount of drainage water.*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1904-07 . . . . . kg.	833.0	636.0	970.9	860.3	1 006.1	839.9	830.0	660.1	963.0	860.3	1 034.8	807.7	1 180.6	1 287.3
1908-10 . . . . . »	682.4	623.6	696.1	660.3	711.8	688.2	710.8	620.4	683.7	708.1	704.1	666.7	637.0	732.2
Totals . . . kg.	= 1 515.4	= 1 259.6	= 1 667.0	= 1 520.6	= 1 717.9	= 1 528.1	= 1 540.8	= 1 280.5	= 1 646.7	= 1 568.4	= 1 738.9	= 1 474.4	= 1 817.6	= 2 019.5

should be noted that in the cases of box No. 13, which was constantly cultivated without green manure, and of No. 14, which lay the amount of nitrogen yielded was about the same (⁶/₉ being in the id ⁴/₉ in the drainage water in the former case, and the whole in the ge water in the latter case). This is the best proof of the importance of keeping light soils in cultivation. The after-effects of the green ma- were very different in the boxes planted with potatoes and in those ch cereals were grown. These differences did not appear in the loss ogen by drainage, but were noticeable in the nitrogen content of bsequent crop, which was larger in the plants grown after cereals, rease being attributable to the action of the stubble. Further, t is stated that the differences in the residues at the close of the experi- were much greater than those of the after-effects, it must be considered ie nitrogen residue is not present in the soil, and that the nitrogen is not utilised by the crops, and not lost in the drainage water, be- denitrified, while the after-effects are due to the stubble. On the con- no decisive after-effect of the green manure can be attributed to its been dug in deeply or superficially, except perhaps as regards in the second case.

he favourable after-effects of the stubble are, on the contrary, evi- nd must be attributed, not only to the fact that it retains some of trogen by checking leaching, but also to the useful action of its position products upon the activity of nitrogen-fixing bacteria. It t otherwise be explained how, with a greater initial deficit in ni- , boxes 6,10 and 12, which were planted with cereals, yielded in 1910 er amount of nitrogen than boxes 1 and 7, in which potatoes were

General Situation of Nitrate of Soda at the End of the First Half-year 1913. — BROWNE, A. G. (Gerente interino) in *Asociación salitrera de Propaganda ular Trimestral*, No. 60, pp. I-LV. Iquique, August 1, 1913.

cording to the last report of the managers of the "Asociación Sa- de Propaganda" the situation of nitrate of soda in the whole world ne 30, 1913, was the following:

oduction. — The data supplied by the establishments for the first ar 1913 and the effective figures for the "nitrate" year, from 1912, to June 30, 1913, compared with those of the preceding year, following: (1).

-year	1st half-year 1912	Difference	« Nitrate » year 1912-13	« Nitrate » year 1911-12	Difference
	tons	tons	tons	tons	tons
175	1 208 540	+ 145 635	2 619 898	2 399 604	+ 220 294

(1) See No. 785, *B.* July 1913. (*Ed.*).

Exportation. — For the same periods of time it was:

1st half-year 1913	1st half-year 1912	Difference	« Nitrate » year 1912-13	« Nitrate » year 1911-12	Differe
tons	tons	tons	tons	tons	ton
1 211 491	1 018 219	193 272	2 632 157	2 441 451	190 70

Consumption. — The amounts consumed during the same periods w as follows:

1st half-year 1913	1st half-year 1912	Difference	« Nitrate » year 1912-13	« Nitrate » year 1911-12	Differe
1 727 536	1 729 450	1 914	2 472 640	2 384 344	88 29

Summing up, the general situation from July 1, 1912, to June 1913, was the following:

I.	Stock existing on June 30, 1912. . .	tons	616 289
II.	Actual production from July 1, 1912, to June 30, 1913.	»	2 619 898
		»	3 236 187
III.	Shipped, July 1, 1912 to June 30, 1913	»	2 632 157
IV.	Existing on June 30, 1913	»	604 030

Forecasts. — The following is a comparison between the forec for the nitrate year 1912-13 and the actual data:

Forecasted production	2 675 271 tons
Actual production	2 619 898 »
Difference	55 373 tons

Thus the forecast exceeded by 2.11 per cent. the actual output.

The production for the calendar year 1913 is expected to be al 2 717 000 tons, taking into account the fact that the effective output the first half-year of 1913 attains almost one-half of the above figure.

This of course always assumes production to be free, for it might modified if the law on the limitation of the production of nitrate in C were to come into force.

Market conditions. — The consumption of nitrate of soda by Europe Egypt has not agreed with the previsions; whilst in 1912 there was an incr of 150 000 tons, in the first half of this year a decrease of 112 260 t

place. This is attributed partly to commercial causes and partly to vourable condition of the cereals in the spring.
n the United States on the contrary, consumption during the same l increased to such an extent as to counterbalance the diminution in e, and to avoid carrying over into the new season an excess of stock. evelopment of imports of nitrate into the United States is remarkable; month of May it reached 87 976 tons, the largest quantity hitherto ted.
tumming up, the total consumption of nitrate of soda in the "nitrate" 1912-13 has exceeded that of the previous year by 90 000 tons; this se was, however, limited by the shortage of nitrate available for the t and is 135 000 tons below the corresponding effective production.

The Development of the Phosphate Industry in Egypt (1). — *The Board Trade Journal*, Vol. LXXXII, No. 875, p. 587. London, September 4, 1913.
ccording to a report issued by the Survey Department of the Egyptian ry of Finance, the existence of phosphates in Egypt was first shown e Geological Survey in 1900. The exploitation of the deposits, how- was not commenced till 1908, and the rapid growth of the output of hates since then is shown by the following table.

	tons		tons
08	700	1911	6 425
09	1 000	1912	69 958
10	2 397		

ow that some of the mines are connected by rail with the coast, the n of phosphates is increasing rapidly.
s there is no factory in Egypt for the manufacture of superphosphates, the local demand for phosphates as manure is at present negligible, ally the whole of the phosphates mined is at present exported. There any low-grade deposits, however, which may in time become of com- l value if a demand should arise for raw phosphate as a manure.

Relative Composition of Different Samples of Basic Slag. — ROUSSEAUX, E. JORET, G. (Yonne Agricultural Station). Composition comparée des scories de hosphoration quant à leur teneur en acide phosphorique et en chaux. — *Bulletin uel de l'Office de renseignements agricoles*, Year XII, No. 8, pp. 957-959. Paris, ust 1913.
e writers found that local farmers prefer to use basic slag of low phos- acid content (8 to 10 per cent.), believing that the deficiency of phos- acid is compensated for by the higher percentage of lime. Several t slags were analysed by the writers with the following results:

(1) See No. 21, *B*: Jan. 1913. (*Ed.*).

	Phosphoric acid	Lime
		%
Slags of poor quality:		
1	10.00	51.50
2	10.04	35.64
Slags of medium quality:		
1	15.88	51.50
2	15.50	35.00
Slags of high quality:		
1	17.60	50.84
2	17.60	43.77
3	18.22	52.75
4	18.88	41.45

These results show that slags of the same phosphoric acid content co tain very varying proportions of lime, and that those with high phospho content are not always the poorest in lime.

It follows that there is no relation between the proportions of phosp ric acid and of lime in slag, since its total chemical composition, dependi on the materials from which it is produced, is very variable.

There is, therefore, no justification of the farmers' preference for a s of low quality.

1248 – **Potash Deposits in India.** – HAYDEN, H. H. General Report of the Geolog Survey of India for the Year 1912, Potash Salts, in *Records of the Geological Su of India*, Vol. XLIII, Part I, pp. 20-21. Calcutta, 1913.

Potash salts have been found in the salt mines at Khewra and N pur (Salt Range, Jhelma, Punjab) by Dr. W. A. K. Christie, but owing the deposits being overlain by seams of unsaleable marl which do not c cern the mining authorities, their investigation is difficult. The princi potash-bearing bed found in the Pharwala section of the Mayo Mine traced at various points for some 850 feet along its strike and over with the dip, which is about N. 30° W., with an inclination of 20 to Its average thickness is six feet, and the potash content varies from to 9.6 per cent. of K_2O. The distances given are indications of the comp tively extensive nature of the deposit, but they are not intended basis for calculation of the material available for extraction, as questi of expediency in pillar preservation complicate the issue.

Another seam eight feet thick and carrying 7.7 per cent. of K_2O found in a prospecting drift in the Pharwala salt; what was presumably same bed was struck in another prospecting drift 700 feet to the E. N.

In the Buggy section of the Mayo mine the only seam of any imp ance that was found was traced for about 150 feet along its strike, w is E. N. E. - W. S. W. The dip of the bed is about 35°, its average th ness two feet nine inches, and it carries 14.4 per cent. of K_2O. The seam th out when followed upwards along the bedding: in another chamber, distance of 170 feet south from the nearest exposure, it was found to be a few inches thick.

'he seam in the Nurpur mine is exposed only in one place which is ılt of access. It dips S. S. E. at about 75° and at this point is six feet

A typical specimen from this deposit carried 14.1 per cent. of K_2O. 'he potassium - bearing minerals of the salt formation are chiefly lang- e and sylvin; kainite and blödite with a small percentage of potassium ten present in small quantities. The deposits are usually fine-grained ıres of these minerals with common salt and kieserite. The economic ıg of the occurrences, together with questions of their mineralogy and s, will be discussed in a paper now in preparation.

The Decomposition of Feldspar and its Use in the Fixation of Atmo- ıeric Nitrogen. — Ross, W. H. (Scientist in Soil Laboratory Investigations, reau of Soils, U. S. Dept. Agr.) in *The Journal of Industrial and Engineering Chem- ry*, Vol. 5, No. 9, pp. 725-729. Easton, Pa., September 1913.

'he extensive search for sources of potash salts which has been under- in the United States during the past two years has naturally led ewed efforts in devising methods for its extraction from feldspar and silicates (1). The total number of patents which are concerned in ıtraction of potash from silicates is at least 40; the various proces- ay be considered in three groups as follows: 1) Processes which yield ı as the only product of value; 2) processes which yield potash, and other saleable material as a by-product; 3) processes in which two or operations are combined in one, yielding a fertilizer containing two re of the essential plant foods (potash, phosphates and nitrogen) in ble form.

f the 40 patents which have been referred to, about half make no ıce to any products of value which can be recovered other than the ı. From the results previously obtained, it is safe to conclude that lue of the product could not cover the cost of the operation.

ost of the others refer to the second group, and among the various by- ıts which are considered possible of recovery are: alumina, silica, nts, raw materials for the manufacture of glass, and hydraulic ce-

Some of these processes are being carried out on a relatively large but no conclusive data have yet been obtained.

Vith regard to the third group, there is the old process of Charles . This consists in the treatment of feldspar with phosphate of lime and ked lime, in oder to obtain both the potash and the phosphate in a ˢ condition. It was however found, on investigation, that much was lost and that only 40 per cent. of the phosphoric acid was ren- ıitrate-soluble. A better result was obtained by adding to the mixture ˢ hematite and manganese dioxide and igniting the whole to about C. All the potash and phosphoric acid were thus obtained in a -soluble condition.

ıe writer's object in the present investigation was to test the efficiency ted feldspar in bringing about the fixation of nitrogen, while there e possibility of liberating potash at the same time.

See No. 1613, *B.* Dec. 1912. (*Ed.*).

The various processes for the fixation of nitrogen may be divided i four groups according to the products obtained, *viz.*:

a) Nitrates or nitrites.
b) Ammonia.
c) Nitrides.
d) Cyanides, or related compounds, as cyanamide.

The processes of the third group are based on the property poss by some metals of fixing nitrogen with the formation of nitrides; it has b found that, instead of using the metal directly, a mixture of the oxide carbon may be employed. The most noteworthy experiments in this rection have been made by Serpek; in these nitrogen was fixed on a la scale with the formation of aluminium nitride by igniting bauxite (alu nium oxide) with carbon at 1800 - 2000° C.

The writer in his own experiments used a feldspar of the following co position:

Silica	64.32 %
Alumina	19.64 »
Ferric oxide	trace
Lime	0.16 »
Magnesia	0.08 »
Potash	13.72 »
Soda	2.18 »

The principal results of the experiment were as follows:

No. of experiment	Feldspar — gms.	Carbon — gms.	Calcium carbonate — gms.	Temperature of ignition — C.	Potash volatilized in percentage of total present	Nitrogen fix of feldspar	of
1	4	2	0.0	about 1200°	5.0	0.20	
2	6	3	6.4	» »	—	0.83	
3	4	2	4.3	» »	55.7	1.27	
4	2	1	2.15	» »	—	1.44	
5	4	4	4.3	» »	—	1.40	
6	2	4	2.15	» »	38.0	1.45	
7	4	2	2.15	» »	—	0.50	
8	4	2	12.0	» »	78.0	0.44	
9	4	2	0.0	» 1400°	41.3	1.00	
10	4	2	2.15	» »	98.0	1.68	
11	4	2	4.3	» »	100.0	6.10	
12	2	4	6.0	» »	100.0	5.21	

The increase of fixation with time of ignition is shown in the following (referring to the experiments 3 and 11):

Time position — ours	Temperature C.	Potash volatilized in % of total	Nitrogen fixed in %	
			of feldspar	of aluminium in feldspar
1	about 1200°	55.7	1.27	12.2
2	» »	68.9	1.34	12.9
4	» »	83.0	1.68	16.1
1	» 1400°	100.0	6.10	58.5
2	» »	100.0	7.44	71.5

Since the nitrogen in aluminium nitride amounts to 51.6 per cent. of luminium, it follows that the nitrogen fixed in the last two experiments nbined in a form that has, so far, not been determined. When boiled water the material gave off ammonia very slowly, though the ammonia volved more rapidly when sodium hydroxide was used.

Equipment is now being installed to carry on the experiments on a r scale and at higher temperatures. In the meantime it was thought able to publish the preliminary results obtained.

- **The Consumption of Chemical Manures in the German Colonies.** — ILLMANN. Wanderversammlung Strassburg 1913. Kolonial-Abteilung, Geschäftsbericht r das Jahr 1912. — *Jahrbuch der Deutschen Landwirtschafts Gesellschaft*, Vol. 28, Part 2,). 429-430. Berl'n, Septemb r 1, 1913.

An interesting index of the incipient development of the consumption emical manures in the German Colonies is afforded by the orders which received by the Fertilizer Section of the German Agricultural Society. quantities, in hundredweights, are given in the following table:

Thus, in 1912 a total of 39235 cwt, of chemical manures was sent to olonies by the German Agricultural Society.

	Superphosphates	Double superphosphates	Basic slag	Peruvian guano	Crude phosphate	Bone meal	Chloride of potash	Sulphate of potash	Kainite	Potash manures	Potassic magnesian salts	Nitrate of soda	Sulphate of ammonia	Cyanamide	Nitrate of lime	Lime and marl
The Planters' Association at Toyo	2	177	197	—	—	—	256	—	8	—	—	2	354	—	—	—
Id. in Kamerun	43	4 653	4 679	—	4 279	10	5 805	2 943	1 065	37	—	5	4 925	12	—	5 263
Id. in East Africa	—	655	8	—	6	2	292	—	—	—	—	—	718	2	2	—
Id. in New Guinea.	—	484	236	—	—	—	650	295	148	—	118	—	453	—	—	—
Id. in the Pacific.	—	136	—	—	—	—	124	—	—	—	—	—	136	—	—	—
Exports to S. W. Africa. . .	—	—	10	10	—	20	—	—	—	10	—	5	—	—	1	—
Total . . .	45	6 105	5 130	10	4 285	32	7 127	3 238	1 221	47	118	12	6 586	14	3	5 263

Influence of the Partial Suppression of Food Reserve in the Grain on the Anatomy of Plants. — DELASSUS, M. in *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, Vol. 157, No. 3, pp. 228-230. Paris, July 21, 1913.

The writer operated on the seeds of *Faba vulgaris*, *Lupinus albus*, *Helianthus annuus*, *Cicer arietinum* and *Cucurbita pepo*, removing half the cotyledons. He then germinated the seeds, and compared the plants thus obtained with others grown from normal unmutilated seeds. In a previous investigation he recorded effects on the external morphology and general development of the plants, and in the present paper he shows how their anatomy is influenced. The total volume and the surface of the plants from mutilated seeds were considerably reduced, as were all the tissues, especially the fibrous and secondary tissues, whose differentiation was retarded; the number of vascular bundles was also diminished.

Research on the Variability of the Sexes in *Cannabis sativa* L. and *Rumex Acetosa* L. — SPRECHER, A. in *Annales des Sciences Naturelles, Botanique*, Vol. XVII, No 5-6, pp. 254-352. Paris, July 1913

Plants of *Cannabis sativa* and *Rumex Acetosa* were grown in 1909 on plots, each of which received a different manurial treatment, in order to determine whether the proportion in which the sexes appeared was affected by the modified food supply. Further, the seed was sorted out into classes according to colour, size and germination energy in the case of *Cannabis sativa* and according to size only in the case of *Rumex Acetosa*, each class being sown on a subdivision of the manurial plot in order to determine whether a correlation could be established between the sex of the plant and the external characteristics of its seed. Out of a total of 38 400 *Cannabis sativa* seeds sown, 23 769 adult plants were obtained, but the following year, when the experiment was repeated with slight modifications, an unfavourable season caused only 4280 plants to survive out of 28 800 seeds sown. *Rumex Acetosa*, being a perennial, flowered the second year only, and a total of 6049 individuals was available for discussion.

The writer reviews the results obtained by other investigators on the subject, and treats his own results according to the statistical methods of Davenport and Johannsen, from which he concludes that manuring has a modifying influence on the proportions of the sexes, and that the sex of plants cannot be predicted from the external characters of the seeds which he investigated (colour, markings, size and weight). The proportion of sexes, though constant for each variety, differed considerably between the different plants considered, being 100 males: 112 females for *Cannabis sativa*, and 100 males: 204 females for *Rumex Acetosa*.

A large number of adult plants were measured and weighed to study the question of sexual dimorphism. It was found that in the case of *Cannabis sativa* the males were taller than the females, being as 120:100 at the flowering stage and 113:100 later on, but on the other hand the females were heavier than the males (130:100). In the case of *Rumex Acetosa* the females were taller than the males (122:100).

Lastly, sap was extracted from a number of male and female plants of the same age and its osmotic pressure was determined as a means of measuring

its concentration. The pressure, though very variable, was almost always higher in male plants than in females, and the difference appeared to be due to the organic material rather than to the inorganic salts, and to be attributable rather to a different stage of development of the plants than to inherent differences between the two sexes; or, in other words, the studies indicated that male and female plants do not mature their sexual organs at the same stage of development.

1253 – **Position and Space given to Individuals in the Selection of Plants.** – MITSCHERLICH, EILH. ALFRED in *Zeitschrift für Pflanzenzüchtung*, Vol. 1, Part 3, pp. 275-285. Berlin, July 1913.

In plant breeding, the selected individuals are certainly planted further apart in order to allow of their increasing as rapidly as possible; the space given is, however, never large enough to permit of the single plants developing without being affected by their neighbours. As, however, the comparison is primarily made between the selected individuals, and not between single groups of individuals, these plants must grow under the same external conditions, for only thus can a correct comparative judgment be arrived at respecting the internal characters, and individual characteristics of the selected plants. This can only be obtained by giving the latter sufficient space to exclude all possibility of reciprocal influence. Further, in order to ascertain the progress made in the selection process, we have two criteria: firstly, the average of all single observations, which show, for instance, that the grain yield increases from year to year, or that the sugar yield of the beets increases. If the external factors are equalized from year to year, the progress of selection during the series of years in question follows the logarithmic function of the law of the minimum (Mitscherlich (1),) for the yield is here the function of the internal vegetation factors. This means that newly selected plants make more progress in the first year than in the second, and more in the second than in the third, etc. The second criterion of the progress of selection follows of necessity from the first; it is determined by the fact that the amount of probable deviation, which can be estimated from observations made upon all the offspring by means of the averages, and which show how far the single individuals deviate from the average for the time being, becomes smaller from year to year, and that consequently the selection is more constant in its transmission and can therefore be continued.

It is, however, impossible to draw such deductions with safety from the figures obtained by the methods of plant-breeding which are at present in use, because the influences of the neighbouring plants vary from year to year and thus prevent any estimation of the increased constancy of the variety, while the yearly varying external vegetative conditions hinder the progress made by the work of selection being recognized from the averages. The individuality of the plant, *viz.* the cha-

(1) *Bodenkunde für Land- und Forstwirte* and Ed. Parey, Berlin 1913. (*Author's note.*)

observed and required by the plant breeder, depend wholly upon vegetative factors. Consequently, the progress made by selec- its can only be estimated accurately if all the external vegetative are maintained year after year in as favourable a condition as poss- 'his is the goal which every plant-breeder must keep before him. s, however, only one method to attain this end: the selected plants be placed singly in pots sunk in the best soil available and watered ith nutritive solutions, so as to keep the soil in a saturated condition out the whole vegetative period. In this manner, it is possible, ing the cultural conditions uniform, to show not only what the plants can do in general, but also how they behave under certain conditions, keeping these also year after year as uniform as possible. e method of planting the selected individuals quite far apart (11 q. ft. to each plant) and watering them as frequently as possible itritive solutions affords perhaps a transition to pot cultures. The nd each plant must be kept very loose and clear of weeds. The soil reeding-plots should be homogeneous, and the subsoil permeable. is method leads necessarily to a definitive breeding system which ith all these requirements, *i. e.* pedigree breeding. Experience has stified the practice of first planting the offspring of selected indivi- urther apart, and deferring field cultivation to the second or third ion. But a number of difficulties are entailed, especially owing to ying physical constitution and want of uniformity of large areas. ese conditions must be taken into account when comparing the yields rent strains, if any clear idea of the success of the selection opera- to be obtained. To this end, control plots must under all circum- (not only in the case of the first and succeeding generation) be estab- nd uniformly distributed throughout the experimental area. It for the sake of security, to plant at least four plots of equal size, strips being the most practicable. If the intermediate strips are to be to account, they should either be planted with seed from the same the same variety, or else another crop with a lower habit of growth e lowest grown for comparison should be used in order to prevent ns of various heights suffering from unequal amounts of shade. e writer suggests the following scheme of arrangement for the plots.

il of similar composition should, as far as possible, be chosen. As ference is likely to occur in a small area, the plots selected for com- should be of limited size. This is practicable if the above scheme ting is adopted. The comparisons are made between the yield of ouring plots, these being planted with different lines (as in the plots

1-7, 2-8, 3-9, etc., 20-26, 21-27, 22-28) and compared. In this manner according to the example, 22 comparisons can be carried out. The fact that in this way the first and last experiment are only made once, the second experiment from the right and left hand only twice, the third one three times, etc., while the seventh experiment from each side and all the intermediate experiments are compared seven times, is justified because the value of the yield of the outside plots cannot be ascertained as accurately as that of those of the central plots, seeing that the variation of the soil in front of the first lot, and behind the last lot is unknown to us. In order to obtain the average from all these figures containing elements due to the differences of soil composition it is necessary to reduce all the results to numbers which are capable of comparison; this is done in the following manner. The average is taken of the crop of adjoining plots planted with different lines, *e. g.* of, lots 1-7 in the diagram. This is taken as m_1, m_b, etc., representing 100. The crop (e) of each of the seven plots from which the arithmetical mean was obtained is reckoned according to this base.

Thus $\frac{m_1}{100} = \frac{e_1}{x}$, or $x = \frac{100\, e_1}{m_1}$.

In comparing the yield of plots 2-8 the average is again found and expressed as m_2 the calculation being effected in the same manner.

Comparable percentages are thus obtained which are independent of the absolute amounts of the crops and can thus all be treated alike. μ_a represents the average for all lines valued as α, with their probable deviations; the average of lines, of b value is taken as μ_b, etc. Further, the average M.; is also obtained of all the averages m_1, m_2, ...; so the actual pressures are easily found by multiplying the single values μ_a, μ_b ... (and their probable deviations) by M and dividing the result by 100. In this way the average values of the single lines (allowing for differences in the soil) are obtained and the defects of the crop resulting from the inequality of the soil are, as far as possible, excluded.

This method of reckoning is naturally only effectual when the parcel experiments already made show signs of unequal soil conditions.

The number of lines used for such an experiment can be either small or very large; in the last case, the only limit to the extension of the experimental ground is the increasing difference in the soil composition. If more than seven lines, or varieties, are used for comparison, it is well to have a second row of experiment plots and again to plant line α as a standard of comparison, etc; by this means the method can be adopted in all cases.

1254 – **Experiment on Thick and Thin Seeding of Wheat carried out at the State Farm, Chapman, Western Australia.** — Report by GEO. SUTTON, Commissioner for the Wheat Belt of the State of Western Australia. *Communicated to the International Institute of Agriculture.*

An experiment to determine the correct amount of seed wheat to sow for hay and grain crops was conducted by the Manager, Mr. J. Langsford, at the Chapman State Farm during the past year.

In this trial the effect of using three different quantities of seed per acre, *viz.* 30, 45 and 60 lbs., was determined.

he plots were arranged according to the attached sketch. It will iced that the plots were in pairs, so that one of the pair could be har- for grain, the other for hay. A buffer plot or division, a drill width wide, cated adjacent to each pair of plots to facilitate harvesting operations. livision was cropped but was harvested for hay. Small uncropped ns about two feet wide were left between the different plots to separate

The first pair of plots and every alternate pair were planted with m quantity (45 lb) of seed per acre. These plots were to act as check y which the yields of the other plots could be compared.

he land used for the experiment is a rather free-working sandy loam. ; fallowed 4 inches deep in the spring of 1911 with a shearer mould- plough.

s the paddock was very weedy, it was decided to delay the planting he autumn rains had started the weeds and then destroy them by culti- . This caused the sowing to be late. After the rains came and the had germinated, the ground was cultivated twice with a spring-tooth ıtor. The seed was then drilled in with 80 lbs. of superphosphate re on June 15. After drilling the ground was harrowed.

he variety used was "Comeback". The seed was obtained from the us main crop of the Farm. It was not graded, but had been re-win- with a Bagshaw winnower, and the small grains taken out. After ng, the crop received no attention until harvest time.

Then the crop was fit to cut for hay, the ends of the plots were trimmed d the area reduced to ¼ acre each. The buffer plots were then t and the plots intended for hay harvested with a reaper and binder tober 14,1912.

he results obtained were as follows:

Hay Yields.

Plot No.	Amt. of seed per acre lbs.	Yield of plot lbs.	Computed yield per acre lbs.	Average of check plot lbs.
2	45	663	2 652	2 670
4	30	580	2 320	
6	45	672	2 688	
8	60	602	2 408	2 464
10	45	560	2 240	

Then the yields of the two check plots on either side of the other plots eraged, it is seen that the results from the medium sowing are greater rom either the lighter or heavier. The difference in the case of the owing is at the rate of 350 lbs. per acre, and 56 lbs. in the case of avy sowing. In the latter case it is so slight as to be negligible. If sults of the medium sowing are expressed as 100 and the other re- ls percentages of this, they will be as follows:

Light sowing	87
Medium »	100
Heavy »	98

The other plots intended for grain were harvested with a stripper harvester on November 25, 1912. The results obtained were as follows:

Grain Yields.

No. of plot.	Amt. of seed per acre	Yield per plot	Computed yield per acre	Average yield check plot
—	lbs.	lbs.	lbs.	lbs.
1	45	260	1 040	1 036
3	30	240	960	
5	45	258	1 032	
7	60	250	1 000	1 056
9	45	270	1 080	

The general results of the grain trial, like those of the hay plots, a in favour of the medium sowing. Expressed as percentages of the resul from medium sowing the results are:

Thin sowing	93
Medium »	100
Thick »	95

The results obtained are those of only one experiment conducted i a single season. They cannot, therefore, be considered in any way conclusive They are, however, suggestive and cause one to wonder whether the almos universal practice of sowing a bushel or more of seed per acre is a sound one

The Rainfall at the Chapman State Farm during the year was as follows

Rainfall 1912: *Chapman State Farm.*

January	0.00 in.	Prior to planting	During growing period of grain section
February	0.06 »		
March	0.09 »		
April	0.33 »		
May	2.13 »		
June 1-14	0.60 »	1.34 in.	
June 15-30	0.74 »		
July	5.40 »	During growing period of hay section	
August	1.65 »		
September	3.81 »		
October	0.83 »		
November	0.26 »		
December	1.36 »		

Total for Year	17.26 inches
Prior to planting	3.21 »
During growing period of hay section . .	12.43 »
During growing period of grain section . .	12.69 »

Sketch of thin and thick seeding.

Buffer Plot.	45 lbs. per acre.	1 drill width	
Check Plot	45 lbs. per acre.		For grain For hay
Buffer Plot	45 lbs. per acre. 30 lbs. per acre.	1 drill width 1 drill width	
Thin seeding.	30 lbs. per acre.		For grain For hay
Buffer Plot	30 lbs. per acre. 45 lbs. per acre.	1 drill width 1 drill width	
Check Plot	45 lbs. per acre.		For grain For hay
Buffer Plot	45 lbs. per acre. 60 lbs. per acre.	1 drill width 1 drill width	
Thick seeding	60 lbs. per acre.		For grain For hay
Buffer Plot	60 lbs. per acre. 45 lbs. per acre.	1 drill width 1 drill width	
Check Plot	45 lbs. per acre.		For grain For hay
Buffer Plot	45 lbs. per acre.	1 drill width	

Elephant Grass or Napier's Fodder: *Pennisetum purpureum*. — WALTERS, J. A. T. in *The Rhodesia Agricultural Journal*, Vol. X, No. 6, pp. 833-836 + plates. Salisbury, Rhodesia, August 1913.

This article is an account of the experiments conducted since the publication in February last (1) of a description of this grass as a new forage plant. Owing to its succulent character and coarseness of stem it does not make good hay, but as green fodder for stall-fed animals it can hardly be excelled by any other crop in Rhodesia.

Propagation. — The best means of establishing a plot of this forage crop is by rooted slips planted singly in rows four feet apart and three feet be-

(1) See No. 499, *B.* May 1913. (*Ed.*)

tween the plants. After two or three years it will be possible to transp every alternate row, leaving the rows eight feet apart.

If cuttings are to be used they should be taken from mature plant May or June and each cutting should be from 18 to 24 inches long planted slantwise with about two-thirds below the ground.

This plant shows remarkable resistance to drought and frost and responds readily to irrigation, but in damp situations where water is li to stand, it wilts and is best replaced by paspalum. On dry situati red or sandy soils, and in cold localities, it is much to be prefered to su cane and will give better results both in weight of fodder and food value

Yield. — During 1912-13 the plot was cut twice when the plants reached a height of 6 to 7 feet and before they showed the least sign flowering. Each cutting gave 12 to 15 tons per acre of green fod If the cutting were delayed until the plant attained a height of 10 t feet the produce of one cutting would amount to about 15 to 20 tons acre and this would form good ensilage either alone or with maize or ve beans.

1256 – **Cotton Farming in the Southwest.** — COOK, O. F. in *U. S. Departm Agriculture, Bureau of Plant Industry, Miscellaneous Papers, Circular* No. 132, pp. Washington, July 1913.

The south-western States appear to be particularly suitable for cultivation of cotton. The dry climate affords protection against the weevil and other pests that often reduce and destroy the crop in East. The dry harvest season also allows the western cotton to be gath and sent to market in better condition. But the possibilities of this re are not yet appreciated, and the agricultural population is still very sm resulting in a high cost of labour and transport.

The writer emphasizes the importance of a highly trained pop tion capable of adapting themselves to local conditions and of produ a high-grade cotton of the Egyptian long-staple quality.

Present methods of living and work are unsuitable, and often en disaster and discouragement. These conditions must be improved, ter systems of houses must be constructed suitable for summer l and irrigation works extended.

1257 – **The Cultivation of Sisal Hemp in Tunis and the Production of from its Leaves.** — GUILLOCHON, L. and GAGEY, R. in *Bulletin Agricole de l'A et de la Tunisie*, Year 19, No. 12, pp. 263-269. Algiers, June 15, 1913.

Experiments have been carried out with *Fourcroya gigantea* and *A rigida* var. *Sisalana* in the Experimental Garden at Tunis.

The results from six-year-old plants are as follows:

	Wt. of raw material	Wt. of dry fibr
	kg.	kg.
Fourcroya	58	0.980
Agave	62	1.660

hus Sisal gives a much higher yield of fibre. From calculations of the f cultivation the writers draw the following conclusions:
) The cultivation of Sisal hemp is profitable in Tunis, provided the et value is high.
) At the price of 3 ½ d. per lb. a net profit of 27*s* per acre per annum g the first six years and 13*s* per annum afterwards is possible; this is a good return for land of medium quality.

. The Cultivation of Cowstring Hemp (*Sansevieraj*). — MICHOTTE, F. in *Agriculture pratique des pays chauds*, Year 13, Nos. 122 and 123, pp. 356-375 and 5-474. Paris, May and June 1913.
he writer summarises the little knowledge available on the cultivation s hemp; he shows that its cultivation may be of considerable impor- , provided the mistakes so far frequently made are avoided.
The fibre obtained from this plant is very durable even under water or this reason is very suitable for the manufacture of ship's ropes. 1 well prepared it has a higher market value than Sisal hemp. crop it has two distinct advantages: it can be harvested at any time e year after it has grown to maturity, and may be decorticated a long after harvesting with no more loss than a little extra work in removing ardened parenchyma. It requires fewer machines, as they can be at work throughout the year; at the same time stoppages of the ines or of picking do not create any difficulties.
The writer finds it difficult to give details concerning the yield of this towing to the variability in the weight of the fresh leaves and the percen- of fibre, but he believes that it gives the highest yield of all the tex- lants, varying from 5 to 5 ½ tons of clean fibre per acre.
Notwithstanding the advantages of this crop, its cultivation does not ease and this fact the author attributes to the unsuitability of machinery. overcoming the difficulties of transport of the raw material (leaves) suggests the adoption of light portable machinery of moderate city.

- Contribution to our Knowledge on the Influence of Sugar-Cane Culti- ation on the Productivity of the Land when put under Maize and Rice. — AN DER STOK, J. E. and VAN HAASTERT, J. A. in *Archief voor de Suikerindustrie in Nederlandsch-Indië*, Year 21, No. 30, pp. 941-949. Sourabaya, July 1913.
The effect of sugar-cane cultivation on the soil and the crops which w it has been receiving the attention of the Government in Java for e time, with a view to safeguarding the interests of the native cultiva- who lets his hand to the sugar grower.
The authors conducted their experiments with 32 plots of 1300 Rhine (5 ¼ rods) each in area and divided into two series. Series A was ted with sugar-cane (variety No. 247) and series B was sown with earth- s. In the following year the whole of the plots were planted with maize the following yields obtained:

Series *A*.	0.6 picul (about 81 lbs.)
Series *B*.	0.4 picul (about 54 lbs.)

Thus the maize was benefited by the sugar-cane.

Next year rice was taken; allowing for experimented error, the was the same in the two series.

From these expeirments the writers conclude that the natives no reason to fear the exhaustion of the soil by sugar-cane cultivation

1260 - **The Coagulation of Hevea Latex by Smoking.** — CAYLA, V. in *Journa griculture Tropicale*, Year 13, No. 146, pp. 231-236. Paris, August 31, 1913.

The writer states that plantation rubber has not yet been equal in quality to that of "Up-river Fine Hard Para", the sup quality of which is attributed to he Amazonian smoking methods believes that the chemical composition of the smoke used on the A zon has no such special action that other materials cannot be used burning, but that the physical and mechanical conditions of coagula and drying determine the ultimate quality of the rubber.

Mechanical effects — The layers of rubber coagulated by smoking very differe t in quality from that of the commercial product.. The co lum is of a creamy white colour, of medium elasticity and conside plasticity. Its physical constitution is gradually changed and its vo reduced; water is given off and it darkens until it becomes black out This slow contraction continues for days and even weeks. In this is effected spontaneously the work that is done by machinery in the tation factories. The coagulation of the latex in successive layers fav this spontaneous contraction, as each layer increases the compressi the inner layers.

The writer believes that the superiority of the spontaneous con tion of the Amazonian rubber over the mechanical pressing of the pla tión product, lies in its slow, regular and continuous action, which a very important effect on the quality of the rubber.

1261 - **Exports of Tobacco from Hungary.** — (Abstracted from the "Comme Industrie de 1912 en Hongrie" published by the Chamber of Industry and Com at Budapest) in *Magyar Dohanyujsag*, Year XXX, No. 18, pp. 4-5. Budapest, tember 20, 1913.

In 1895, the first year of reorganisation, the exports of Hungaria bacco into the countries levying import duties amounted to only 4 800 lbs.; since then it has gradually increased, until in 1912 it exce 25 000 000 lbs.

During the last five years the Hungarian Tobacco-Merchants, Soc has exported the following quantities:

	lbs.
1908	19 740 000
1909	20 710 000
1910	22 210 000
1911	20 980 000
1912	25 625 000

The quantities of tobacco exported from Hungary to various countries ring 1912 are given below :

	lbs.
France	5 790 320
Netherlands	6 752 120
Belgium	1 030 610
Mediterranean Ports	5 463 240
Germany	2 700 600
Switzerland	1 554 200
Denmark	4 9840
England	1 332 170
Egypt	156 310
Portugal	427 080
Total	25 632 490

1 - **Coca and the Cocaine Industry in Peru.** — POZZI-ESCOT, EMM. L'i Coca et sa Culture. Extraction de la Cocaïne. — *L'Agronomie tropicale*, Year 5, Nos. 4 and 5-6, pp. 39-52. Uccle, April-June 1913.

For many years Peru was the chief producer of coca, and consequently of cocaine; but this cultivation is now practised with great success in Far East. The increased production has lowered the price to one half former value and left only a very narrow margin of profit for the grower. is situation requires the attention of the agriculturist and chemist be- any improvement is possible.

The two principal coca districts of Peru are the upper valley of the Rio cama and the region of Huanuco.

1. *The valley of the Chicama.* — This valley is situated on the western pes of the Andes and the crop is grown at an altitude of 1500 3000 m. (5000 to 10 000 ft). This region enjoys the dry climate racteristic of the high Cordillera, and the soil is poor.

2. *The Huanuco region.* — This region, known as the montaña, has ropical climate : constant heat with high humidity. The soil is a rich ivium, characteristic of damp tropical regions with luxuriant vege- ion.

The coca of Huanuco is considerably richer than that of the Rio Chi- a, the amount of cocaine in 1 kilo of dried leaves being 8 to 10 grams 5 to 7 grams respectively in the two districts.

Cultivation under shade is easier, requiring less water and less work, giving a greater total production of leaves. This is therefore, a better tem of cultivation for exporting the raw coca, but the yield of alkaloid onsiderably less than from plants grown without shade, sometimes only hird as much.

For increasing the yield of cocaine it is desirable to cut back the shrubs rder to encourage the development of young leaves which contain the hest proportion of the alkaloid. Before planting, the land should be irely worked; the method of planting in pits must be abandoned, as the ts do not succeed in making their way out. The author recommends use of dynamite for effecting this operation economically.

While in the growing of coca there is ample room for improvement, is still more the case with the process of extraction. In this case it is adv able to pass the leaves through a mill and effect the extraction by diffusi thus reducing the operations and obtaining a better yield. It would a be advantageous to collect the precipitate formed on the addition of al by means of a filter press.

A point of considerable importance is the extraction of ecgonin, wh should be carried out by a methodical exhaustion of the leaves by me of a warm slightly acid liquid in diffusers similar to those employed in tannin industry. This method would allow of utilizing the old or ferm ted leaves in which the cocaine has been destroyed, leaving only the ec nin. By this method of extraction the yield of alkaloid is almost doub and the industry made more profitable.

1263 – **Cultivation of Limes in Dominica.** — DESLANDES, R. and CHALOT, C *L'Agriculture pratique des pays chauds*, Year 13, Nos. 120 to 123, pp. 177-195, 327, 388-403 and 437-443. Paris, March-June 1913.

Lime growing is a profitable industry in several of the British Antil Along with cacao it has changed the economic feature of Dominica, wh at the time of the sugar-cane crisis of 20 years ago had no other agricultu product to fall back on. This article points ont the value of the lime indus for the French Antilles and other countries liable to suffer the consequen of relying on a single crop.

The variety cultivated in the British Antilles is *Citrus medica* v *acida*, which includes two cultivated varieties: the "common lime" and "spineless".

The common lime produces a small fruit yielding a large quantity juice. The spineless variety is of growing importance. The maintena of the plantations and the picking of the fruits is easier and the conten citric acid is greater than that of the common lime, though the yiel juice is less.

The best conditions for growing limes are: 1) Altitude not gre than 400 m., (1300ft.; 2) rainfall of at least 100 to 120 in., distributed eve throughout the year; 3) a gentle slope facing south or south-west soil rich in potash and nitrogen, and well drained; 5) proximity to a p

The writers describe the various cultural operations. The pips sown in nurseries and the young plants are planted ont when they h reached a height of 16 to 18 in.; they should be 15ft. by 15 ft. on the le somewhat less on slopes. Some planters intercrop their trees with X *thosoma sagittifolia* and *Colocasia esculenta* for the first two years. Li are greedy of nitrogen and potash. Green manuring with *Canavalia e fomis* and *Cajanus indicus* suffices to supply the former. Suckers and d branches should be removed as often as possible.

Limes are liable to the attacks of two scale insects: *Mytilaspis citri* and *Lecanium viride*, which do considerable damage. Spraying with a pe fin or soda-lye and resin wash is generally employed against these enem The lime borer (*Deptostilus praemorsus*) often causes serious damage. C

and burning the dead wood and blocking up the holes is adopted to the larvae.

Most of the fruits are used for the extraction of juice, and as the formation of acid is not completed until the fruits are fully matured, they are gathered directly but allowed to fall to the ground. The average annual yield per acre varies between 22000 and 36000 lbs.

The juice is extracted in mills, rarely by pressure, and strained through a copper sieve to remove the organic matter which would give rise to fermentation and deteriorate the product. It is prepared for commerce in three forms: raw juice, concentrated lime juice and citrate of lime.

The raw juice is extracted by means of granite rollers to obtain the product as pure as possible. It is used in medicinal products and choice liqueurs, but owing to its lack of keeping qualities the quantities exported are decreasing.

Concentrated lime juice is obtained by evaporating the raw juice to $^1/_8$ or even $^1/_{12}$ of its volume. Owing to its concentration it has excellent keeping qualities and a low cost of transport.

The preparation of the concentrated juice involves several disadvantages: *a*) a loss of 8 per cent. of citric acid; *b*) use of considerable quantity of fuel; *c*) a dark coloured product; *d*) heavy expenses of packing with possibility of loss.

To obviate these defects citrate of lime is prepared, as at Palermo, by the addition to the juice of a lime salt. This must be free from impurities such as magnesium, iron, alumina. The usual substance employed is pure lime prepared by burning corals. The point of complete neutralization must not be reached, or the impurities will be precipitated in the form of lime. Complete neutralization is attained by means of chalk. The precipitate is washed by a jet of warm water, and put through a filter press and afterwards dried. It is brought to about 10 per cent. of water; it is then free from liability to ferment and contains about 70 per cent. of pure citric acid.

Some plantations prepare essence of limes; the profits from this fully cover the expenses of the treatment of the raw juice.

LIVE STOCK AND BREEDING.

— **Cattle Dipping at Short Intervals.** — LAWS, H. E., in *The Agricultural Journal of the Union of South Africa*, Vol. V, No. 6, pp. 871-879. Pretoria, June 1913.

Before the outbreak of East Coast Fever and the discovery by Lounsbury that it was transmitted by the brown tick, cattle dipping was considered necessary more often than once a fortnight, or just sufficient to keep the ticks in check. When it was realised that this tick needs a comparatively short time of its life history on the host and became necessary to eradicate it, more frequent dippings than once in five days had to be resorted to.

Four varieties of brown ticks: *R. appendiculatus*, *R. capensis*, *R.*

simus and *R. nitens*, and the red-legged tick (*R. everisi*) are capable transmitting the disease from a sick animal to a healthy one. The l named tick has two hosts and spends more than five days on each.

The brown ticks, on the other hand according, to Watkins-Pitchford's vestigations, require a minimum larval period of 68 hours and a nymp stage of only 72 hours. It is therefore necessary to adopt a three-day ping period in order to stamp out all the ticks from an infested farm.

This system, however, has not been an unqualified success in N and the Cape Province. The reasons for this are many. The larval nymphal red ticks are usually found low down in the hollow of the whilst brown ticks in all three stages infest both the inside and outsid the ears and around the eyes. Dipping baths are inadequate if the ani is not obliged to take a "header".

The strength of dip recommended for three-day dipping is one arsenious oxide to 1250 parts of water—or 1 lb. arsenite of soda (80 % senious oxide) to 100 gallons of water. Watkins-Pitchford found that solution combined with an emulsion and applied every three days sufficiently strong to stamp out East Coast Fever. It killed the ticks or animal and the emulsion ensured a uniform protection against fur pathogenic ticks.

The following experiments were carried out in March 1910 to ascer what strength of dip is required, its effect on the cattle and at what inte it must be used in order to prevent ticks from feeding on the dipped anir No pathogenic ticks were available for these experiments, so that free from ticks had to be taken as sufficient criterion of the efficacy of any ticular treatment.

Cooper's Cattle Dip was used in two strengths 1-150 (arsenious o 1 part in 600 parts of water), and 1-200 (arsenious oxide 1 part in 700 of water).

Infestation of the experimental cattle was maintained by allo undipped infested cattle to run alongside them.

The dip was applied by hand spraying, and the cattle were thoroı overhauled before and after treatment and the difference noted.

The animals were sprayed 20 times in all and generally all the b and red ticks were killed at each spraying. After the second spra no adult blue ticks were found. About 50 per cent. of the male bont a few of the female bonts were killed at each spraying. In one inst two female bonts stayed on throughout the whole series of experin (94 days). No tick of any species engorged itself during the period.

As a result of these experiments the author concludes: 1) it is pos to apply an emulsion containing arsenious oxide (1 in 800) every four and one of strength 1 in 600 every five days without injury to the ca 2) four-day spraying will keep cattle practically free from ticks in a fested area: 3) a hand dressing of the ears and tail is desirable to plement the spraying: 4) whenever East Coast Fever threatens, all should be dipped every five days with an emulsion of 1 in 800, a an outbreak occurs, the interval should be reduced to four days.

5 - **Experimental Investigations into the Relationship between Human and Bovine Tuberculosis.** — EBER in *Centralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten*, Vol. 70, Part 5-6, pp. 220-278. Jena, August 23, 1913.

Since early in 1903, continuous investigations into the connection be- een human and bovine tuberculosis have been carried out at the Veterinary stitute of the University of Leipzig. Detailed studies have, so far, been ade of tuberculosis in 16 children, 3 women, 12 men and 9 cows.

The writer first gives a detailed account of the order of the different erations in the experiment (inoculation of human material into cattle, roduction of bovine tuberculosis into cattle, etc.), and then gives the ta of the experiments which are noted chronologically in an appendix d described from a uniform point of view. He concludes that bovine tu- rculosis constitutes a source (and in the case of children, one which should t be underrated) of human tuberculosis. The presence in the alimen- y canal of a child of the bacilli of bovine tuberculosis gives rise to alte a- ns which may result in death, and in no way differ, either macroscopi- lly or microscopically, from those due to the bacillus of human tuberculosis. rther, in the case of adults who have died from general tuberculosis, some- nes the bacilli of the bovine form have proved to be the sole pathogenic ents.

Systematic intraperitoneal, and simultaneous intraperitoneal and bcntaneous injections were made into cattle, using human bacillus, which harmless to the latter. The material was inoculated after passage through guinea-pig. This treatment in many cases produced peritoneal tubercles ; traperitoneal and subcutaneous inoculations were simultaneously made m these and proved very virulent in their action on the cattle used for e experiment. The writer only once succeeded in producing similar effects simultaneous subcutaneous and peritoneal injections of pure cultures material obtained from human subjects,

While pure cultures from the peritoneal tubercles of the cattle first inocu- ted, when introduced by subcutaneous inoculation showed increased, t not yet typical, virulence, pure cultures from the peritoneal affections curring in cattle which had died of acute tuberculosis due to inoculation re excessively virulent. In 2 out of the 7 cases of increased virulence, happened that the material from the human subjects contained exclus- ely bovine tubercle bacilli, which from their long stay in the human body, d forfeited their toxic property, slightly in the one case, but to a con- derable extent in the other. No such explanation exists in the other 5 ses of increased virulence; further, there is no ground for the belief that e bacilli of bovine tuberculosis were associated from the beginning with ose of human tuberculosis in the material obtained from human subjects, introduced in the course of the experiments.

The writer therefore regards the systematically increased virulence oduced in these 5 cases by further inoculation as type changes, and nsiders it a proof of the near relationship between the two varieties of bercle bacilli occurring in mammals, and entitled by Kossel, Weber, d Hanss, *Typus humanus* and *Typus bovinus* respectively. Whether

the change of type is caused by certain peculiarities of the bacilli prese in the human material, or by the individual characteristics of the cati experimented upon, or whether it depends upon both these factors, t writer could not determine.

1266 – **Contributions to the Knowledge of the Ferments of the Mammary Gla and of Milk.** — GRIMMER, W. in *Biochemische Zeitschrift*, Vol. 53, Part 6, pp. 4 473. Berlin, July 24, 1913.

The object of the investigator was to determine whether milk fermer are present in the mammary glands, and whether resting or active mamma glands show any difference in their ferment content. The glands of cov mares, ewes and sows were used in the investigation. They were first fre from all visible blood vessels, and from the connective tissue and fat, a then crushed to a pulp. From the latter, extracts were obtained by aut digestion and by the use of common salt and of glycerine, and a juice pressure. All of these were tested by the writer with the following ferment protease, ereptase, monobutyrase, amylase, salolase and peroxydase. In ma cases, an examination of the milk followed that of the mammary glan

The results are given in seven tables, and show that proteolytic fermer were present in the resting and active mammary glands of the four speci investigated. The only difference was that the products of protein d composition from the active glands always contained tryptophane, whi was not the case in the resting glands. This discovery leads to importa conclusions regarding the function of active mammary glands. The fun tion of the proteolytic ferment of resting mammary glands is probabl like that of the proteolytic ferment present in other organs, to bring abo the metabolism of the cells of the gland, and for this the disintegration tryptophane is unnecessary. On the other hand active mammary glan which produce casein, require a ferment to effect the synthesis of this co pound. The writer believes that the body protein when turned into mi protein is entirely split up into its components. This is rendered pro able by the fact that the auto-digestion products of the resting glands a ways contain albumoses and peptone, substances which are absent from t active glands.

In his investigations of ereptase, the writer found that the extrac of active and resting glands were able to separate tyrosin from silk pepton Whether this separation was due to the proteolytic ferments, or to fermen which only split up peptones and polypeptides, could not be discovered. is probable that the peptolytic and proteolityc ferments are not the sam The peptolytic ferment is much weakened by the autolysis of the glands an also by the dialysis of the extracts and press-juice.

The active and resting mammary glands of all the animals examine also contained a monobutyrin-splitting ferment, the effect of which w much diminished by dialysis. It is therefore probable that the mamma glands are the source of the monobutyrase of milk.

The mammary glands of mares and sows possess, in the resting and a tive stages alike, a powerful ferment for breaking up starch. In the ca of the cow the resting glands have much more power of breaking up star

n the active ones. The resting glands of the ewe have no special amylo-
c property. From this, the writer concludes that the amylase in the
k of different species is an original ferment.

All the press-juices and salt extracts examined also have the power of
aking up salol. Contrary to the opinion hitherto held, the writer believes
t this power of decomposing salol is not a saponification due to alkali-
, but a pure ferment action. This is rendered probable by the fact
t, through dialysis, the alkaline reaction of the extracts with litmus
illy disappears without any loss of the power of breaking up salol.
ther, salolase can be destroyed by heating neutral solutions containing it
without appreciably altering their alkalinity. The writer also succeeded
recipitating the salol-disintegrating agent by means of ammonium
hate and subsequently re-dissolving the precipitate with water.

As a result of his investigations of peroxydase, the writer concludes that
power of oxydising guayacum tincture possessed by the milk of cow, ewe
goat is not attributable to inorganic catalytic agents, but is a process
ferment nature. This ferment should be regarded as original and formed
n the gland begins active secretion. No ferment capable of colouring
yacum tincture blue seems to exist in the glands of mare or sow, in the
ing glands of cow or ewe or in sow's milk. In these, the writer merely
nd in all cases a ferment which oxydises paraphenylenediamine and was
ly destroyed by heat.

In conclusion, the writer touches on the functions of these ferments;
thinks that they are concerned with milk production, but does not ex-
n the part they play in the process.

- **A Method of Determining Early Stages of Pregnancy in Mares.**— BERN-
HARDT in *Zeitschrift für Gestütkunde und Pferdezucht*, Year 8, Part 7, pp. 145-148.
Hanover, July 1913.

The investigations made by Professor Abderhalden at Halle-a-S. re-
ling the ferments present in the bodies of animals have proved that sub-
ces foreign to the species, and especially those foreign to the blood,
n introduced directly into the latter, quickly disintegrate and disappear.
s disintegration is due to the action of ferments which make their
earance shortly after inoculation (sugar after a few minutes, and pro-
within three or four days). The introduction of substances proper
he blood, on the other hand, leads to no ferment formation. If the sub-
ce used for inoculation is protein, the ferments which develop are pro-
-destroying enzymes; if raw sugar is introduced, the ferments formed are
se which possess the property of breaking up sugars. The introduction
at into the blood by means of a diet rich in fatty substances leads to the
duction of ferments which split up fat. The power possessed by the
od of breaking up these compounds lasts for from two to three weeks
r the introduction of the latter, and disappears as soon as the foreign
stances become incorporated into the blood.

Protein-destroying ferments are therefore always to be found in the
od of an animal when it becomes pregnant. These ferments have the

property of breaking down placenta-protein; they disappear again in fr
10 to 14 days after the birth of the young. Animals which are not pregna
have no ferments in their blood plasma capable of breaking up placen
protein.

On the basis of these observations, Prof. Abderhalden has devised
chemico-biological method by means of which it is possible to determi
whether an animal is pregnant or not, the earliest stages being capa
of detection (1).

The writer gives a description of this method, and sets forth in det
how it may be applied to mares. The method consists in introducting in
the blood serum of a mare a fragment of placenta-protein foreign to the s
cies ("Artfremd"); the mixture is dialysed and the product investigat
If peptone is present, this testifies to the existence of ferments in t
mare's blood; if the peptone reaction is absent, the blood lacks ferme
Thus, according as to whether the blood contains ferments or not, the pr
nancy or non-pregnancy of the mare can be determined. The reliabili
of this method depends upon the care with which it is carried out. It
therefore advisable to follow carefully the given directions:

I. — *The composition and preparation of the dialysing membranes.*

The best membranes are those supplied by Messrs Schleicher and Sch
(Germany); these are supplied to the market marked 579 A. As soon
they arrive the membranes should be boiled for 5 minutes in distilled wat
they should be kept in the same water. Before use, the membranes mu
be tested for impermeability to proteins and permeability to peptones.
These tests are carried out as follows:

a) *Test for impermeability to protein.*

5 c.c. of freshly filtered egg-albumen are put in a graduated cylin
water is added to make up 100 c.c., and the whole well shaken to mix it. Th
2.5 c.c., of this mixture are placed in a membrane which has been soake
for ½ hour in cold water, the exterior of the membrane is well washed, a
the membrane placed in an Erlenmeyer flask containing 20 c.c. of d
tilled water. Upon the membrane and the contents of the flask a ½ c
layer of toluol is poured. The whole is now covered with a watchglass a
put into an incubator to dialyse. After 16 hours, the solution may
tested for protein. For this purpose, 10 c.c. are placed with 0.2 c.c. of 1
solution of ninhydrine (triketohydrindenhydrate) in a graduated reag
glass, mixed, and boiled over a Bunsen burner (a sterilized glass rod 10 c
long being introduced to prevent bumping). The whole must be well boi
(every membrane alike) but loss of substance should be avoided. T
time when the first gas bubbles appear on the side (usually after a f
seconds) is noted; the glass is then held in the flame till the liquid b

(1) A description of the scientific principles and of the technique of the method
given by the above-named investigator in his book: "*Abwehrfermente des tierischen
organismus*". 2nd Edit. Springer, Berlin.

rously; it is then held in the side of the flame half way up till one ute has elapsed from the appearance of the first gas bubbles. When reagent glasses are cool, the colour of the fluid is examined. If it olourless, the membrane which contained it is impermeable to protein; e liquid is coloured blue, the corresponding membranes are useless and ld be rejected.

b) *Test for equal permeability to protein decomposition products.* — All membranes which have been proved to be impermeable to protein, are roughly cleaned by being first placed for ½ an hour in flowing water subsequently ½ minute in boiling water. They are then prepared 2.5 c.c. of 1 % silk peptone solution (" Pepton Höchst "), washed rnally and placed in a flask with 20 c.c. of sterilized water. The cons of the flask and the membranes are again covered with a ½ cm. layer oluol and a watchglass, and are placed in an incubator to dialyse. After hours, the dialysed solution is examined for diffused peptone, the same hod being used as in the case of the protein. The water in which the mbranes were boiled, in all the reagent glasses, should, if the mem-es are all equally permeable, be coloured the same degree of blue. e tint given by some membranes is lighter or darker than the averolour, the membranes are to be rejected as worthless.

The good membranes are first washed, then placed in boiling water 0 seconds, and finally put into sterilized water to be kept.

The flasks in which they are preserved must be quite full of water.

II. — *Preparation of the placenta protein.*

After the membranes have been tested, the placenta-protein is prepared. h placenta only should be used. This is first externally freed from blood eing put into a physiological solution of common salt; the chorion and mbilical cord are then removed and the placenta is cut into pieces about ize of a shilling and crushed in flowing ordinary water. The pieces are ed in a cloth from time to time. All those which are not easily freed from d are rejected. The others are then reduced to a pulp until they form ow-white mass of tissue, and boiled in an enamelled pot with 100 times volume of distilled water containing five drops of glacial acetic acid itre. The pulp is boiled for 10 minutes, the water is poured off through a ened filter and washed; the pulp is then washed for 5 minutes in distilled r, and the boiling is repeated, fresh water being used without the addi- of acetic acid. This process is best repeated about six times without ruption. Finally the boiled water (filtered) is tested for protein deposition products, 5 c. c. of the liquid being mixed in a beaker with 1 c. c. % ninhydrine solution, and the whole boiled over a burner, as in the of the membrane testing. If a blue colouration appears, the mixture iled till this is no longer visible. At this point, the placenta is placed erilized water in a bottle with a ground-glass stopper, covered with a of chloroform and toluol reaching to the stopper, and set aside. Pla-protein thus prepared keeps a long time.

III. *Method of obtaining the blood serum.*

57 gall., separated milk 224 gall. — cost £ 4 6*s* 4*d*, or 2*s* 7·77*d* per calf week.

Lot 4. *Whole milk.* — This lot continued the whole milk diet through in nine weeks they consumed 356 gall., costing £ 10 7*s* 8*d*, or 5*s* 9·22*d* calf per week.

Lot 5. *Crushed oats and separated milk.* — These animals were bor a fortnight later and consumed rather more milk during the first three we For the first six days of the experiment they took 1 lb. of crushed among them daily; as the proportion of separated milk was increased oats were increased to 2 lbs. daily. After 24 days they were receiving gall. of separated milk and 4 lbs. of oats daily. The oats were alw given dry and never mixed up with the milk or made into gruel. Dur the nine weeks they consumed 208 lbs. of oats, 66 gall. of whole milk, 296 gall. of separated milk, costing £ 5 0*s* 10*d* or 2*s* 9·61*d* per calf per w

The results obtained by the different systems of feeding are compa in Table I.

TABLE I.

Lot	Food	Increase per calf per week	Cost of each increase of live we
		lbs.	d.
1	Cod-liver oil	9.66	3·33
2	Calf meal	8.66	2·77
3	Gruel	8.33	3·45
4	Whole milk	12.83	5·39
5	Crushed oats	13.30	2·52

From this table it will be seen that the crushed oats gave the hi gain in live weight and at the lowest cost per lb. of increase. The next est gain was with whole milk, but the cost, it will be noticed, was increased. Between the other feedings there was not much to choos

At the end of the nine weeks of special feeding the calves were t out into the yard and all fed alike with separated milk, a little linseed and crushed oats. Later the milk was given up and they were turne the fields and given linseed cake, crushed oats and hay. Shortly afte (at nearly 5 months) they were castrated. At the end of twenty week were weighed again and the results obtained are set forth in Table

TABLE II.

Food	1st Period		2nd Period.	Whole Period.
	Average daily gain per head	Cost per head per week	Average daily gain per head	Average daily gain per head
	lbs.	s d	lbs.	lbs.
liver oil	1.90	2 8.19	1.63	1.74
f meal	1.75	2 0	1.53	1.62
el (3 calves) * . . .	1.57	2 4.67	2.01	1.84
ole milk	2.00	5 9.22	1.90	1.94
shed oats (3 calves)**	2.19	2 9.61	1.90	2.00

One calf removed from experiment owing to scouring.
The calf died from anthrax.

Table II shows that not only did the crushed oats and separated feeding give the highest gain at the least cost during the feeding of weeks with the special foods, but that subsequently, when the calves turned out in the fields and all fed alike, the total live weight nued to be higher with this lot than with any of the others. This to the conclusion that the influence of the early feeding of calves an important bearing on their after development and that a "good " is very essential.

It is intended to carry on this experiment until the bullocks are ready sent to the butcher.

Experiments on Pig Fattening in Prussia with Automatic Feeder or Common Trough. — DE LA BARRE in *Tiersuchinachrichten der Landwirtschaftskammer für e Provinz Brandenburg und Mitteilungen der Versuchsstation für landwirtschaftliche Fütterungsversuche zu Karstadt (Westprignitz)*, Year 6, No. 8, pp. 114-117. Prenzlau, August 31, 1913.

The object of these experiments was to ascertain which of the two ods of feeding was the more expensive. Sixteen pigs, eight weeks bi the improved Hanoverian breed were used: they were divided into ots. Shortly after the beginning of the experiment one animal was ved from each group.

Group I was fed by an automatic feeder (Holtenberg's system) and II was fed from a common trough three times a day with food slightly ened with warm water. During the first eight days of the experi- the pigs received as drink 2 litres (1 3/4 quarts) of centrifugated skim to which some wheat meal and barley groats were added. The fattening continued until the average weight of 220 lbs. was reached.

The composition of the rations during the experiment is shown in I.

TABLE I.

Age of pigs in weeks	Barley groats	Wheat feeding meal	Potato flakes	Körnerbutt-futter (grain and blood food)	Fish meal	Maize groats	Rye groats	Qua... given to ea... of pi...
	Parts							
8	12	6	2	2	1	—	—	
12	4	2	2	1	1	2	—	
16	6	4	5	2	2	5	—	
20	8	6	6	2½	2½	8	—	
24	8	6	6	1	2½	8	2½	
28	8	6	6	1	2½	8	2½	
30	8	5	5	1	2½	8	2½	

Lot I attained at the age of 28 weeks all but one day the desired a... age weight of 1 quintal (220 lbs.) per head; lot II reached it at the a... 30 weeks and one day.

The cost of the food for the first lot was £ 19 12*s* 3*d* and for the se... £ 17 14*s* 0*d*.

The increases of weight at the different ages are given in pound... Table II.

TABLE II.

Periods in weeks	Lot I (7 pigs)			Lot II (7 pigs)		
	Initial weight	Final weight	Increase during period	Initial weight	Final weight	Inc... du... pe...
8 to 12	216	404	188	224	334	
12 » 16	404	641	238	334	508	
16 » 20	641	950	309	508	746	
20 » 24	950	1 257	307	746	104	
24 » 28	1 257	1 540	283	104	1 351	
	(27 days)					
28–30 + 1 day . . .	sold		—	1 351	1 540	

The following figures give the results of the fattening:

Lot I.

Receipts

	£	s	d
7 pigs (total weight 1540 lbs.) £5 13s 8d each	39	15	8

Expenses

	£	s	d			
Purchase price of 7 pigs	9	12	1			
Cost of feeding	19	2	11			
Attendance 139 days	2	7	8			
Insurance	2	1	2	33	3	10
Net profit				£ 6	11	10
Net profit per head					18	10
Cost of production of 1 cwt. of live weight				£ 2	8s	2d

Lot II.

Receipts

	£	s	d
7 pigs (1540 lbs.) at £ 5 13s 8d each	39	15	8

Expenses

	£	s	d			
Purchase price of 7 pigs	9	12	1			
Cost of feeding	17	14	0			
Attendance 154 days (1)	3	14	0			
Insurance	2	1	2	33	1	3
Net profit				£ 6	14	5
Net profit per head					19	3
Cost of production of 1 cwt. of live weight				£ 2	8s	0d

follows from this experiment that from an economic point of view not much difference between the use of the automatic feeder and the common trough. For undermanned farms the automatic might be recommended.

The Value of Potatoes as a Principal Pig Food. — LEHMANN in *Journal Landwirtschaft*, Vol. 61, Part 3, pp. 361-397. Berlin, July 21, 1913.

The writer enumerates the causes which have led to a change in the of fattening pigs. He gives an account of the fattening experiments le at the Göttingen Experiment Station with the object of finding aying system based on the use of potatoes as the chief ration. The re given as a basal ration 2.2 lbs. of chick peas ("Gramerbsen") 2 lbs. of fish meal.

e feeds for comparison, maize in experiment I, and potatoes eriments II, III and IV, were fed in as large quantities as the

(1) This item is ¼ d higher per day and per head than in lot I on account of the amount of attendance this lot required.

animals could consume. As their need of food increased, a l amount of the feeds to be compared was given to the pigs. A little was also added during the first weeks of the experiment. In experime the animals were allowed from the first day to eat as many potat they could. In experiments III and IV, on the contrary, the potatoes fed during the two first four-weekly periods according to the weight pigs. During this time, the latter were also given a little rye chaff; in e ment IV meat meal was substituted for this from the third weekly p Experiment I was a test of corn or maize feeding, experiment II a t rapid fattening on potatoes; in experiment III the pigs were fatten potatoes after a preliminary period, while in experiment IV they were tened on potatoes after a preliminary course of meat meal. The ex ments fell into 4 × 2 = 8 divisions. Nos. 1,6 and 8 began with 6 ended with 5 pigs; Nos. 2, 3 and 5 began and ended with 6 and Nos. 4 a with 5 pigs. The animals were of selected native breeds and wei as follows according to the divisions: 1 = 46.0 lbs.; 2 = 46.6 lbs.; 49.1 lbs.; 4 = 50.6 lbs.; 5 = 46.4 lbs.; 6 = 46.0 lbs.; 7 = 43.1 8 = 46.2 lbs.

The pigs were fattened until they each attained the weight of fro to 242 lbs., which necessitated 5 ½ four - weekly periods. The weights and the increase in the four experiments are given in Tal

TABLE I.

Pig		Final weight in lbs.						Incr in w per lbs.
		1	2	3	4	5	6	
Experiment I	Lot 1	253.0	264.0	283.1	218.9	201.1	—	187.
	» 2	280.5	172.5	326.0	341.7	179.3	126.3	
» II	» 3	213.0	217.1	192.3	270.4	214.3	173.8	168.
	» 4	229.4	192.5	246.2	227.9	217.6	—	
» III	» 5	238.3	254.4	275.2	256.5	268.8	153.3	187.
	» 6	234.7	231.0	178.6	258.9	212.3	—	
» IV	» 7	251.2	244.2	229.2	227.5	213.0	—	188.
	» 8	171.8	231.0	265.1	245.5	238.0	—	

The animals fed on maize and those given potatoes thus develope ferently; this the writer attributes to inequality in appetite.

On an average the latter were more uniform in size and larger th former.

'he weights in pounds of maize and potatoes consumed per head per re given in Table II.

TABLE II.

	I Maize fattening	II Rapid fattening with potatoes	III Potatoes (with preliminary fattening) without meat meal	IV Potatoes (with preliminary fattening) with meat meal
riod of four weeks)	0.73	5.37	1.21	1.28
» » » »	0.86	5.08	1.83	1.74
» » » »	2.09	7.79	9.86	9.99
» » » »	2.86	11.07	14.54	12.23
» » » »	4.18	15.09	18.17	15.03
» » » »	5.37	16.65	21.45	18.55

n all the experiments, therefore, the pigs were able to consume more in proportion as they became older. This increase, however, showed sooner in the case of the maize-fed animals and proceeded with more arity than in that of the pigs fed on potatoes, which, as is shown by iment II, only consumed an appreciably larger quantity of potafor the third four-weekly period. In experiment VI considerably fewer oes were eaten than in experiment III, no doubt owing to the meat given, which appears to diminish the power of potato consumption. The total quantity of nutritive substances and of pure protein consumed he increase in weight per head per day are given in pounds in Table III.

Table III.

	Total of nutritive substances	Pure protein	Total increase in weight	Amount of total food used for 100 parts of increased weight
xpt. I.	3.61	0.581	1.214	296
II.	3.63	0.451	1.091	332
III.	3.74	0.458	1.217	308
IV.	3.63	0.546	1.217	296

The potatoes therefore supplied the pigs fattened on them with large an amount of total nutritive substance as maize when used as a tening ration. The latter, however, produced more increase in weight cause it has a higher pure protein content. Pigs fattened on potatoes a preliminary period attained the same weight as those fed on maize spite of the lower protein content. The reason for this in experim III was, probably, the increased power of hydrocarbon assimilation sequent upon the good fattening preparation, while in experiment IV meat meal had produced an increase in the protein content of the po ration.

Consequently, the latter method must be superior to the first, se that it entails no increase in the total amount of the food rations, but a change in the proportion of nutritive substances. The different re of the several experiments are clearly shown by Table IV, in which profits are worked out per pig.

	Gross Profit			Net Pr.
	£	s	d	s d
In fattening on maize	1	7	3 3/4	10 5
» rapid fattening on potatoes	1	3	7 1/2	6 9
» fattening on potatoes after preliminary period	1	10	8 1/4	13 10
» fattening on potatoes + 0.22 lbs. meatmeal after preliminary period	1	11	5 3/4	14 6

It is thus shown by the experiments that rapid fattening is much profitable than the other systems of fattening with potatoes, or than fa ing on maize. Fattening with potatoes with a preliminary period, du which meat meal may or may not be fed, is, however, far superior to fat ing on maize. There are therefore methods of fattening with potatoe a principal ration which are as efficacious as those based upon the us maize.

1272 – **Methods of Fattening, Dressing and Marketing Poultry.** – MITCHELL, I in *Monthly Bulletin of the Missouri State Board of Agriculture*, Vol. XI, No. 2, pp. Columbia, Mo., February 1913.

The good points in a suitable table bird are: 1) a well shaped body, long and deep, with back and breast broad, legs short and well apart; 2) good health; and 3) the ability to stand forced feeding in confinement. Birds of this type should be selected from the flock mated with similarly well-shaped male birds so as to build up a strai reliable pedigree.

One of the most popular breeds of farm chickens is the Barred mouth Rock, a strong hardy bird laying as many eggs as any of the ge

se breeds. Birds with yellow skin and shanks are preferred in the markets.

Young birds that have been allowed free range are not in good market tion, but having good body frames, they respond to feeding very ly and will gain in weight from 25 to 40 per cent. in two weeks time if rly cared for. The writer carried out experiments on different rations e Pennsylvania Experiment Station during the fall of 1911, with the ing results:

1. Birds fed on corn meal and meat scrap moistened with water d in weight twice as much as birds fed on shelled corn and meat s.

2. The addition of wheat to a diet of shelled corn and meat (maize) ed the increase in weight.

3. Birds fed on corn meal and buttermilk and kept in a fattening gained in weight three times as much as birds feds on corn meal alone, his gain was made at a cost of about 3 ½ *d* (7 cents) for each pound d, whilst the cost of the gains of the birds fed on whole grain ranged 1s 3*d* to 2s 6*d* (30 to 60 cents) for each pound gained.

These results prove that whole grain does not fatten chickens and that best results are obtained by feeding finely ground feeds to birds ned in crates.

The writer describes a fattening crate and method of constructing it. The birds are placed in the crate 24 hours before receiving their feed. Food is given sparingly at first to enable the birds to stand up r under the heavy feeding to follow. They are allowed to eat as much ssible, 20 minutes usually being sufficient time. Regularity and clean- s are essential in maintaining the birds in good condition.

The feed should be finely ground. An excellent fattening ration con- of the following:

24 lbs. of white bolted (sifted) corn meal.

6 lbs. of low-grade flour, or good-grade of wheat middlings.

4 lbs. of pea meal, or finely ground hulled oats.

ne pound of the dry mixture is mixed with two pounds of butter- o form a thin butter that will pour out of a bucket. Sour milk may he place of butter milk, or 15 per cent. of meat scrap may be added : mixture if water is used. No grit, green food or water should be to crate-fattening birds and the process should not extend beyond the 1 week.

The writer experimented with different rations on birds fed in crates g the fall of 1910 at the poultry department of Cornell University.

The rations were made up as follows:

Pens 1 and 2:

24 lbs. of white bolted corn meal
6 lbs. of low-grade flour
1 lb. of oatmeal
1 lb. of pea meal
1 lb. of buckwheat middlings
1 lb. of wheat middlings.

Pens 3 and 4:

12 lbs. of white bolted corn meal
4 lbs. of low-grade flour
6 lbs. of oatmeal
6 lbs. of pea meal
4 lbs. of buckwheat middlings
2 lbs. of wheat middlings.

Pens 5 and 6:

1 lb. of white bolted corn meal
7 lb. o low-grade flour
10 lbs. of oatmeal
10 lbs. of pea meal
8 lbs. of buckwheat middlings
4 lbs. of wheat middlings.

All these rations were mixed in the buttermilk to the consistency butter. The birds were fed three times a day (at sunrise, 11.30, and 4; for a fortnight. Their appetites were good, except one bird in each of p and 4 and two birds in pen 5.

The results obtained are shown in Table I.

The amount of feed consumed by the birds in each pen varied slight Two birds were removed from pen No. 1. during the experiment a were not reckoned in the per cent .gain. The birds in pens 1 and 2 made t best gain, those in 3 and 4 the next best, and in 5 and 6 the least ga The gains are in proportion to the amount of the rations.

The birds in pens 1 and 2 had the best appearance. They were w filled out, creamy white in colour, with the fat well distributed over t body. The birds in pens 5 and 6 had wrinkled skins and poor colour a had little fat distributed over the body. When drawn the entrails a gizard showed practically no fat.

The writer describes the methods of killing and cleaning poult Effective bleeding is obtained by inserting a knife into the bird's mou on the left side of the neck and giving a downward diagonal cut wh severs the two main blood vessels in the neck. By piercing the brain the centre of the head a little behind the eyes the muscles of the skin w relax and the feathers can be pulled out easily.

For encouraging the better marketing of poultry, the writer recomme organisation of the producers to ensure better market prices and adds an appendix a copy of the constitution and by-laws of one of these organi tions, taken from *Bulletin* No. 208 of the Ontario Department of Agricult

TABLE I. — (*weight in lbs.*).

At beginning	At end of 1st week	At end of 2nd week	Before killing	Dressed	Total gain	% gain	Total of feed
22.9	27.9	30.3	28.75	25.75	7.4	32.4	Grain . . . . . 25.7 B. Milk. 51.4
30.8	36.25	38.5	36.25	32.5	7.7	25.2	Grain . . . . . 26.35 B. Milk. 52.70
30.85	37.35	38.4	36.4	32.45	7.55	24.4	Grain . . . . . 25.25 B. Milk. 63.12
31.25	37.05	39.65	37.22	33.5	8.4	26.5	Grain . . . . . 26.6 B. Milk. 66.5
31.0	35.75	37.95	35.32	31.1	7.0	22.5	Grain . . . . . 25.6 B. Milk. 76.8
31.1	35.75	37.35	34.95	31.5	6.3	20.2	Grain . . . . . 22.5 B. Milk. 67.5

Results of the Season 1912-13 of the Service for the Control of Silkworm g Breeding in France. — *Bulletin mensuel de l'Office de Renseignements Agri-s*, Year 12. No. 7, p. 799 Paris, July 1913.

he service of Control of Silkworm Egg Breeding created by decree ril 26, 1907, with the object of assuring the freedom of the eggs from e (both for home use and for exportation to countries which require ntees in this respect) has carried on its work during the season 1912-13. wo inspectors, directors of the sericulture stations of Draguignar Alais respectively, and eleven controllers have been employed in the

he number of establishments inspected was 88, and the reports that distinct improvements have been effected as much in the on for breeding purposes as for the quality of the cocoons.

rom 497 666 lbs. of selected cocoons, 34 645 lbs. of egg swere obtained. umber of cases certified by the Service reached 537 575, containing l of 23 893 lbs.

he number of batches of eggs sampled in the rearing establishments xamined at the stations of Draguignan and Alais totalled 2749, of only 16 were found to be diseased .This result shows how carefully tches attacked by pébrine had been removed by the egg-breeders and ntrollers of the Service.

1274 – **The Stickleback, a Source of Danger in Fish-Breeding.** – Mitteil. d. Kgl. Bayer. Biolog. Versuchsstation für Fischerei in München, in *Allgemeine Fischerei-Zeitung*, Year 38, No. 17, pp. 441-442. Munich, September 1, 1913.

The two species of stickleback occurring in Germany, *Gasterosteus aculeatus* and *G. pungitius*, are often attacked by *Nosema anumalum*, a parasite belonging to the sporozoa. The seat of the infection is usually the exterior wall of the body, on which white tumours, often as large as peas, but not malignant in character, sometimes appear in such numbers as to give the fish the appearance of being encrusted with pearls. The parasite may, however, penetrate into the internal organs, and notably the ovary, when it is no longer harmless.

According to Dr. Kunt (Norway), *Nosema* also occurs on sea-trout and plays a conspicuous part in the troubles of the Piscicultural Institute at Laerdal. Here it has been exclusively found in the ovaries of its victims. The parasite penetrates into the eggs and destroys them. In the coast region of West Sweden gudgeon (*Gobius niger*) has been attacked by *Nosema* and the egg-production of this fish has been affected. The parasite has not yet been found in artificially bred fish in Germany. The systematic destruction of the sticklebacks' nests is recommended as the best method of preventing infection.

The article contains an illustration showing a stickleback covered with *Nosema* tumours.

1275 – **Contribution to the Study of Furunculosis, especially with regard to the Salmonidae.** — HULSOW, KARL in *Allgemeine Fischerei-Zeitung*, Year 38, No. 17, pp. 250-253; No. 18, pp. 458-463. Munich, May 15 and September 15, 1913.

Furunculosis, which chiefly occurs among the Salmonidae, is an infectious disease caused by a specific bacterium, *Bact. salmonicida*. It is usually characterised by the presence in the muscles of furuncles containing blood and pus. These are, however, often absent, and the intestine becomes inflamed and bloody infiltrated patches make their appearance on the organs. The typical form of furunculosis is a general infection of the blood, having its origin in the intestine. The furuncles always make their first appearance after an inflammation of the intestine. Death frequently occurs before the formation of furuncles and often even previous to the appearance of the bacteria in the blood. In the latter case, the bacteria remain exclusively in the intestine. The writer gives the name of intestinal furunculosis to this form of the disease, the fatal ending of which is due without doubt to the bacterial toxins making their way into the blood. He also distinguishes a latent form of furunculosis, in which the bacteria are present in the intestine of the fish but have no effect upon its health.

It is not known why the disease appears under different forms. Perhaps there are several species, or varieties, of the bacteria, differing from one another in the effects they produce on the fish. The increased virulence of the same bacterium might, however, account for the phenomenon. The greater toxic action probably also plays a part in the varying severity of disease; thus in open waters sometimes few fish die, while on other occasions almost the whole stock is carried off. The various forms of furun

sis may also depend upon the different behaviour of the fish towards bacteria.

This is probable from the facts that the fry are immune to the cks of the furunculosis bacteria, and that one-year-old fish in open rs are fairly immune to the natural occurrence of the disease, and do asily contract it when inoculated. This fact renders it probable that g fish have the power of rendering the invading bacteria innocuous, and efore possess a certain degree of immunity against furunculosis.

For the control of the latter, the writer recommends, as a result of nvestigations at the Experiment Station at Munich, the removal from rater of all dead or infected fish, when it is a case of open waters. Unless precaution is taken the diseased fish continue to liberate spores into rater, and the dead victims, especially when they decay, form excel- breeding places for the bacteria. All implements which have been used fected waters should after use be dipped each time in lime water, or ution of permangan te (1 : 100 000), or else disinfected by having ng water poured over them. If furunculosis breaks out so violently the whole stock is in danger, it is advisable to remove all the fish from water. The writer recommends permanganate in a solution of)0 000 for the disinfection of the breeding ponds.

The spore content of the water is first ascertained, then the required mt of the salt is dissolved in water, and poured into the pond. A with 62 550 spores per c.c., when thus treated by the writer, was l after one hour's time to contain only 98 spores. After 24 hours had ed, the number of spores per c.c. had increased to 3830, and in two to 12 580.

The samples for counting were always taken from different depths spots, and show that it is possible to obtain an equal distribution e salt. This method is only suitable to use in the case of ponds which the fish have been removed. The writer recommends a 50 000 solution of the salt for the destruction of bacteria in ponds ed with fish. In both cases it is necessary to repeat the disinfec- at 2 to 3 days' interval.

- **Manuring Experiments on Fish Ponds.** NERESHEIMER in *Monatshefte für ndwirtschaft*, Year 6, Part 8, pp. 225-238. Vienna, August 1913.

The writer criticizes the experiments made by Kühnert-Preets on nanuring of fish ponds in Schleswig-Holstein (1) and refutes his results.

) Published in *Fischerei-Zeitung*, Vol. 16, No. 26, pp. 323-329. Neudamm, June 29, 1913. (*Ed.*).

FARM ENGINEERING.

1277 – **Development and Present State of Agricultural Machinery.**—Fischer, in *Zeitschrift des Vereines Deutscher Ingenieure*, Vol. 57, Nos. 30, 31 and 32, pp. 1169, 1212-1218 and 1263-1268. Berlin, July 26, August 2 and 9. 1913.

The development of agricultural machinery did not arise in con quence of the demand on the part of farmers for better implements or machinery. The first steps are almost exclusively due to the machine dustry itself. Technical progress and social and economic changes indu farmers to use machines. The writer treats in his paper only of s groups of machines as deserve special mention either for their import or for the technically successful way in which the problem set before t has been solved.

The oldest form of drilling machine was in two separate parts, first of which was a one-horse two-wheeled chariot, which by mean shares opened six furrows; the other part which followed was the seeder on wheels, which was pushed by a man. A great improvement on was the English drilling machine invented by James Cooke and unmista ably the forerunner of modern drills. The seedbox is broad, the seeding s which raises the seed by means of small scoops is driven by an inter diate shaft, and the seed falls through funnel-shaped tubes into the hol shares that open the furrows. The most recent drills differ from Coo in the steerable fore-carriage and in the jointed lever to which the hol shares are fastened; thus every share can follow the inequalities of the while the steering of the fore-carriage facilitates the straight running of machine and consequently the straightness of the rows.

The writer points out the difficulties which have still to be overc in the construction of a good drill and proceeds to discuss the develop of manure spreaders. These resemble drills in some points, but present greater difficulties as they have to deal with the most various kinds of nures. One of the simplest and oldest forms is that in which the ho has a slit in its bottom through which a stirring shaft pushes the ma By adjusting the breadth of the slit the quantity of manure spread be regulated. At present the most commonly used manure spread the chain spreader, in which the slit is not in the bottom but in the of the hopper, so that the manure cannot fall out by itself.

The demand for a reaping machine is very ancient. The inve of a practical reaping apparatus instead of harvesting by hand cons in the introduction of the principle of shearing, upon which Meare's machine was patented in 1800. In 1807 Salmon invented a hand m with several scissors placed side by side so that no haulm could es Patrick Bell in 1826 constructed a practical machine, in which the c bar was situated in front of the reaper which was pushed by horses harn behind it; another important feature was a reel that beat the grain against the blades and platform attached. The further improveme the cutting apparatus was due to Americans, chiefly to Obed Hussey

rus Mc Cormick, whose works still occupy one of the foremost positions. the same time, both in England and in America, innumerable devices

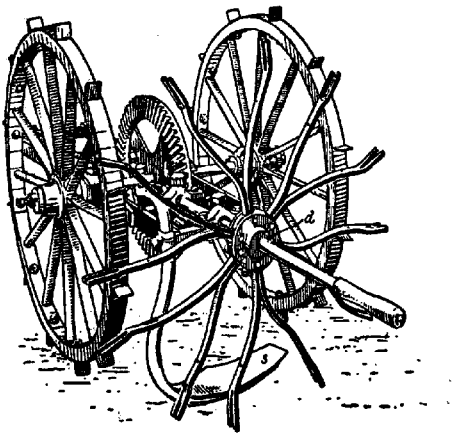


Fig. 1 — Hanson-Münster potato digger.

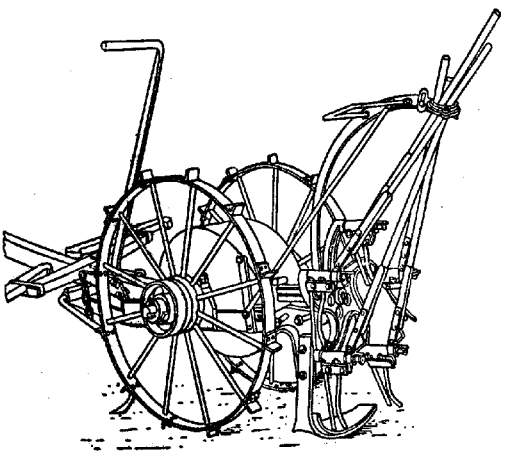


Fig. 2. — Harder's potato digger.

re invented with the object of improving the apparatus for discharging e cut crop, among which Robinson's invention of rakes revolving around

an inclined axis was one of the best. Shortly after, these rakes were m
with articulated joints and caused to revolve on a cam as at present u

As for binders, in one of the earliest of these machines a wire was c
ried by a needle arm round the sheaf and then simply twisted into a k
But binding with wire has the inconvenience of easily allowing bits of
to remain in the straw. In recent binders the knives are as usual arran
on the shearing principle, and each end of the cutter bar is provided
dividers, of which the most important one is the outside one which se
ates the wheat to be reaped from that still left standing.

In the development of hay rakes the only noteworthy feature is
gradual decrease of weight due to the improvement of the material

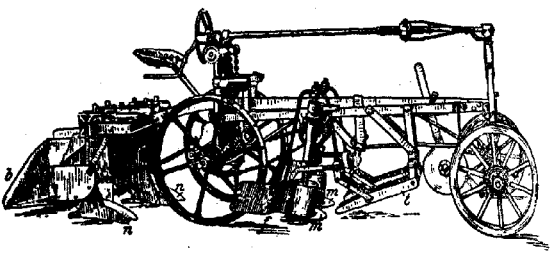


Fig. 3. — Siedersleben & Co's beetroot-lifter.

which they are made, and the greater facility of lifting the teeth by ut
ing the weight of the driver.

For harvesting roots and tubers the difficulties in devising were m
greater than in the case of cereals. The best machines of this kind
those derived from Count Münsters' improvement of the Englishr
Hanson's machine. Fig. 1 shows the Hanson Münster machine,
out of date, but from which George Harder's potato digger has
developed (Fig. 2). The forks are no longer fastened directly to the thr
wheel but by means of joints. The beet-lifter with topping appara
shown in Fig. 3, which works quite well under fairly difficult conditi
has been built during recent years by Siedersleben and Co. of Bernburg.

The first threshing machines were of the most varied types. Cylind
pestles and beaters attempted to imitate the work of the flail, but
the invention of the concave with revolving drum gave a truly efficient
chine. The writer describes the barred-drum threshing machine invented
Andrew Meikle in Scotland in 1780. His bars were provided with proj
ing teeth. In America toothed bars are generally used, while in Eur
their use is limited to small machines, because they break up the straw
diminish its value. Retaining Meickle's drum, threshing machines h
been much improved by the introduction of more efficient shakers, ridd

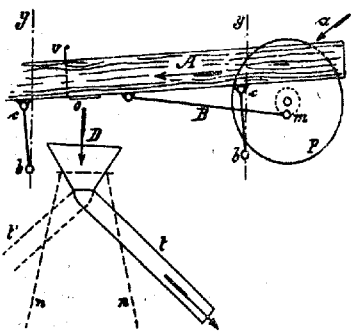
ns, etc. They were soon mounted on wheels, like the portable engines, s to be easily moved as required. A large up-to-date threshing machine l all the recent improvements can easily turn out 1100 to 1300 bushels ean wheat per day. The writer describes a modern threshing outfit and s some important details of threshers, after which he reviews some w presses.

Straw presses have been used in North America since the middle of century. In Germany the want of them was not felt till much later only in the nineties did they begin to spread in consequence of the de- d for straw for paper mills and other industries, while at the same straw was produced in excess of the requirements of the farms.

After a description and illustration of some apparatus for loading and sporting for agricultural purposes, the writer considers the most dis- ed question in the matter of agricultural machinery, namely that echanical tillage, and concludes his paper by remarks on the economic ortance of machinery for agriculture, industry and foreign trade.

1- **Transport of Grain in Granaries.** — RINGELMANN, M. in *Journal d'Agriculture Pratique*, Year 77, Vol. 2, No. 38, pp. 366-368. Paris, September 18, 1913.

This simple and cheap device consists, as may be seen from the accom- ying figure, of a wooden channel which can be subjected to a swinging tion.



Device for the transport of grain in granaries.

The grain which is raised by an elevator falls in (*a*) into the wooden nel which consists of a bottom and two upright sides. This channel ached high up to the roof of the granary and runs along its whole h; it is only very slightly inclined and is supported in (*b*) on articulated s (*bc*) which can move to and fro. The supports (*y*) are fastened to oof beams and carry the bearings (*b*). At the upper end of the channel g wooden connecting rod is attached, the other extremity of which is ned to a crank which revolves by means of the pulley (*P*). In the

bottom board of the channel there are several openings (*o*) closed by a
Partitions (*v*) are used to close the channel when the slide (*o*) is opened.
der the opening a hopper (*D*) with an inclined zinc pipe (*f*) is placed
receive the grain falling through (*o*) and to lead it where required in
granary.

In the second part of his paper the writer, together with two illus
tions of such a device existing at Norville (Seine-et-Oise, France),
its dimensions, of which the following are the principal.

Length of channel	83 feet
Breadth	6.4 inches
Depth	6.4 "
Inclination	8 per 1000
Extent of swing	6 inches
Revolutions per minute	120

1279 – **Trial of a Draught Regulator for Winnowers.** — (Report of the Machine Te
Station of the Agricultural Association for Rhenish Prussia). — GIESSLER in *Da*
Landwirtschaftliche Presse, Year 40, No 74, p. 882. Berlin, September 13, 1913.

The uniformity of speed of the draught of winnowing machines, e
cially those driven by hand, is only approximately attained; for this
son application of a wind regulator, which, within certain limits, alt
completely does away with the effect of the inconstant number of rev
tions, is to be considered as a useful improvement, all the more so s
increases the price of the winnower by only about 5 shillings.

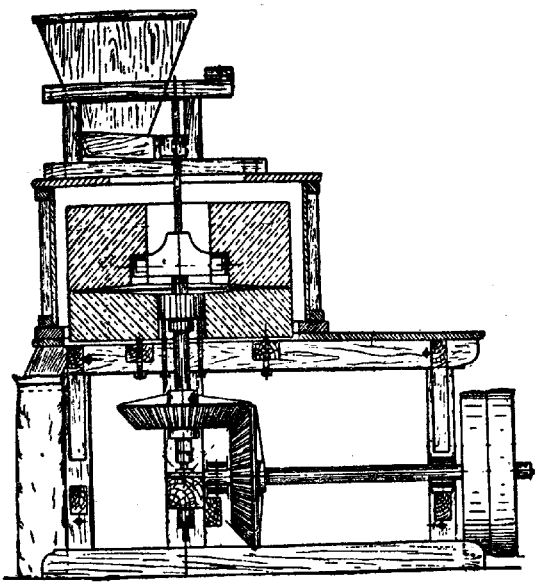
The writer, after describing the apparatus and its working, rep
upon the experiments and their results, according to which the greatest
viations from the wind velocity obtained by 46 revolutions per min
were as follows:

Revolutions of crank handle per minute	A. Entrance of air completely open		B. Entrance of a partially close	
	Wind valve always closed	Wind valve worked by regulator	Wind valve always closed	wind v wor by reg
from 42 to 46	0.58	0.42	0.37	0.0
from 46 to 50	0.58	0.00	0.37	0.0
Average.	0.58	0.21	0.37	0.0

The deviations in the velocity of the wind at 42 to 50 revolut
per minute can thus be reduced by the regulator by from 0.58 : 0.21 = 1

- **Trial of a Groat Mill.** — WOTRUBA, R. in *Maschinen Zeitung*, Year 11, No. 18, p. 217-219 Berlin, September 15, 1913.

The mill stones of the groat mill shown in the accompanying figure ft. 3 in. in diameter.



Molino triturador de muelas.

On trial the mill gave the following results:
Normal output per hour: 881 lbs.
Power required for running mill: 5.6 kilowatt per hour.
Power required for grinding 110 lbs.: 0.7 kw. per hour.
Cost of energy re uired for grinding 110 lbs. at the rate of 2.34*d* kilowatt-hour: 1.65*d*.
Power required at the driving pulley: 8 HP.

1281 – **Milking Machines: their Sterilization and their Efficiency in Producing Clean Milk.** — WING, LOIS W. in *Cornell University Agricultural Experiment Station Circular* No. 18, pp. 65-74. Ithaca, New York, May 1913.

Milking machines are expected to deliver milk free from dirt and bacteria, but in practice this result is not possible without considerable attention to the cleaning and sterilisation of the machine.

The present experiments were arranged to test: 1) the efficiency of machines in producing a high grade of milk, and 2) the amount of care necessary to keep the machines in a sterile condition.

The first experiments were conducted at a laboratory and a farm near Little Falls, New York, in 1911. The stable was whitewashed and had plank floor, whilst the feeding alleys, mangers and gutter were of cement. No unusual care was given in keeping the stable and cows clean. The machines used throughout the experiment were the Burrell-Lawrence-Kent cow-milkers.

The sterilization was carried out by various methods, using brine, alcohol, hydrogen peroxide, potassium permanganate, copper sulphate, acetic acid, and hot water as germicides. Samples of milk were taken for bacterial counts each night.

As a result of the experiments the writer concludes:

1. — Brine solution, as generally used for the treatment of rubber tubes and teat-cups, does not keep them in a sterile condition.

2. — Although the milking machine excludes external contamination to a marked degree, the milk may still have a high bacteria count owing to contamination in the tubes.

3. — The rubber tubes and teat-cups may be kept in a practically sterile condition by the use of a salt solution containing chloride of lime.

4. — The chloride of lime solution should be made fresh at frequent intervals to effect complete sterilization.

5. — If the machines are kept in a sterile condition, it is possible to obtain milk with low bacteria count.

1282 – **Trial of a Small Steam Cream-Pasteurizer.** (Report of the Dairy Institute at Proskau). — KLEIN in *Molkerei Zeitung*, Year 23, No. 31, p. 366. Berlin, August 2, 1913.

This pasteurizer is horizontal and is of very simple construction. The cylinder, which is of copper and is provided with a stirrer, measures only 7 inches in diameter and 10 ½ inches in length and is surrounded by an iron steam-jacket.

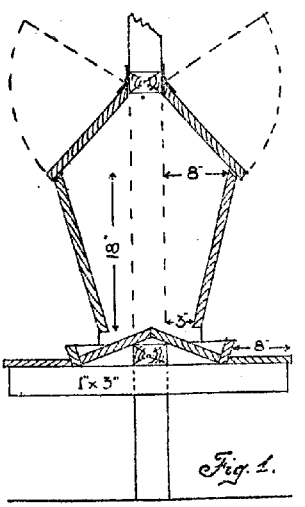
During the trial sixteen separate tests were made during which the cream to be converted into butter and containing an average of 24.1 per cent of butter-fat was heated to about 75° C. After cooling it was acidified with Moser's pure cultures and churned. The fat content of the cream and the buttermilk were carefully determined each time in order to ascertain the yield in butter. The same determinations were made on the samples of unpasteurized milk used as control.

he result of the trial was favourable ; the pasteurizer worked satisfac- without imparting any taste of cooked or burnt milk to the butter. erage of 17 ½ gallons per hour passed through the pasteurizer. The ge time required to make the butter from the pasteurized cream was inutes longer than for the unheated samples. The yield in butter was er cent. for the pasteurized cream and 97.5 per cent. for the other

n the whole this pasteurizer seems well adapted to bring the pasteuriz- cream within the reach of the smallest steam dairy.

A Handy Feed Hopper. — Orr, E. A. in *The Country Gentleman*, Vol. 78, o. 37, p. 1341. Philadelphia, September 13, 1913.

he writer describes a hopper in use at Fort Collins, Colorado, for feed- arcoal, grit-oyster shell and mash. Its advantages are that it feeds rds in two different pens without taking up extra space, is econo- and easy to construct, and does not become clogged in use. Fig. 1. ; a section of the device with the boards slanting at the bottom ow the feed to escape easily and to prevent its remaining in the e of the device and spoiling. Fig. 2 shows the device in position ts suitability for low houses and filling with food from the outside ut entering the pen.



Section of hopper.

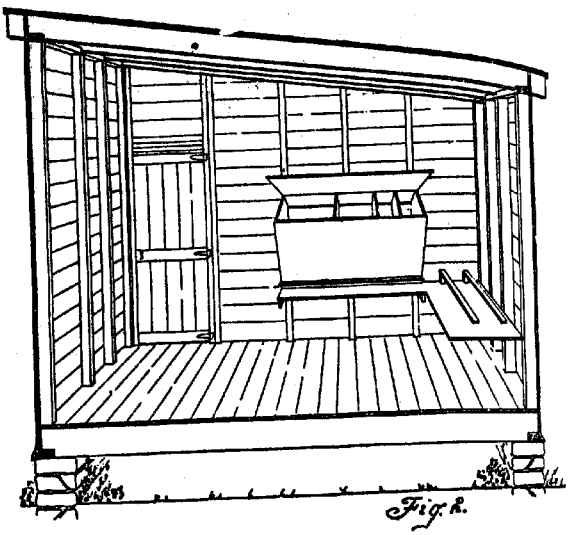


Fig. 8.

Position of hopper in fowl-house.

1284 – **Review of Patents.**

Tillage implements and machines.

264 196 (Germany). Apparatus for applying a subsoiler to the side of a frame plough, wit ferential wheel adjustment.

264 336 (Germany). Turn-wrest plough with revolving beam.

264 716 (Germany). Tractor for interchangeable agricultural implements.

61 002 (Austria). Tilling machine with drum-shaped implement carrier.

59 891 (Hungary). Apparatus for two-engine ploughing.

60 216 (Hungary). Motor-plough.

59 806 (Hungary). Cultivator plough.

1 069 835 (United States). Reversible plough.

1 069 875 (United States). Tractor.

1 070 362 (United States). Traction-engine.

1 070 281 (United States). Cultivator.

456 337 (France). Improvement in vineyard ploughs.

456 670 (France). Motor spader.

456 914 (France). Improvements in ploughs with fore-carriage.

11 949 (England). Motor plough.

130 979 (Italy). Ploughing machine.

61 334 (Switzerland). Plough.

61 847 (Switzerland). Plough with apparatus for planting potatoes.

Manure distributors.

264 323 (Germany). Chemical manure distributor with throw wheel.

265 651 (Germany). Cylinder manure distributor.

[illegible] distributor with sowing apparatus.

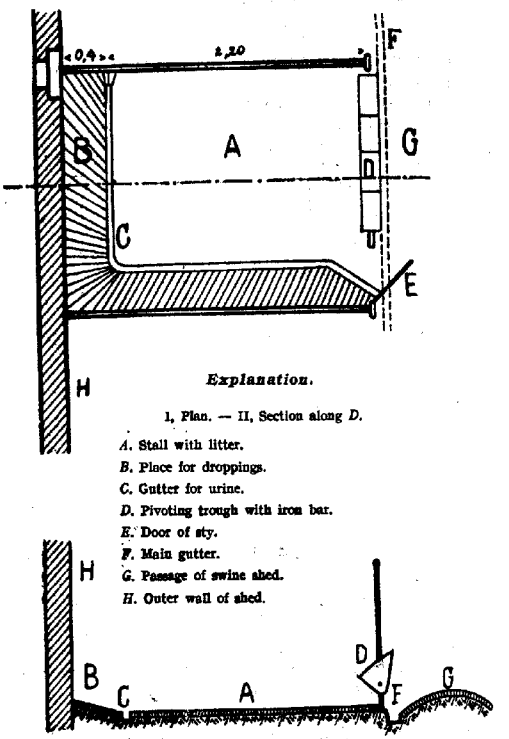
Drills.
5 (Germany). Drill with distributing wheels in seed hopper.
(Hungary). Potato-planting machine.
98 (United States). Potato-planter.
6 (France). Improvements in drills.
(England). Seed drills.
Reapers and mowers.
7 (Germany). Automatic ungearing device for mowers.
(Austria). Mower.
55 (United States). Mowing machine.
05 (United States). Mowing attachment for motor vehicles.
8 (France). Improvements in mowers.
9 (France). Mower with reaping attachment.
(England). Mowing machines.
3 (Italy). Application of motors to mowers.
Machines for lifting root crops.
7 (Germany). Apparatus for lifting potatoes while ploughing.
(Hungary). Potato-lifting machine.
1 (France). Potato-lifting machine.
(Switzerland). Throw-wheel for potato-lifting machine.
Threshing and winnowing machines.
(Austria). Grain-cleaning machine.
9 (France). Automatic feeder for threshing machines.
(England). Threshing machine.
Other agricultural machines and implements.
9 (Germany). Grubber.
9 (Germany). Pea-sorting machine.
(Austria). Chaff cutter.
(Hungary). Root cutter.
46 (United States). Machine for cutting sugar cane.
30 (United States). Insect exterminator.
3 (France). Device for milking-machines.
3 (France). Sprayer.
(England). Elevators.
9 (Italy). Esiccator for rice, maize, wine pomace and the like.
3 (Italy). Continuous rotary press for citrus fruits.
(Switzerland). Continuous fruit press.

A Practical Flooring for Pigsties. (1) — MÜLLER VON BERNECK in *Mitteilungen des Vereins Deutscher Schweinezüchter*, Year 20, No. 18, pp. 363-365. Berlin, September 15, 1913.

The flooring for pigsties shown in the accompanying figure is but slightly sloping; it is surrounded by a small gutter which issues by the door into the main gutter. Round two sides of this flooring on which the animals lie there is a belt 16 to 20 inches wide, for their droppings, which is more inclined than the rest of the floor and is formed of ribbed cement. The inclination of this belt is 25 to 27 in 100, while that of the rest of the stall is

(*Ed.*).

only 2.25 in 100. The liquid excrements run off into the gutter, w
the solids remain and are moved every day or every other day.
centre of the sty des not get wet and the litter keeps in good condit
some days longer than in other sties, and the animals have a dry
The bars which are frequently placed along the walls for the protec



Explanation.

I, Plan. — II, Section along *D*.

A. Stall with litter.
B. Place for droppings.
C. Gutter for urine.
D. Pivoting trough with iron bar.
E. Door of sty.
F. Main gutter.
G. Passage of swine shed.
H. Outer wall of shed.

Flooring for stye.

of the suckling pigs are not required in this sty, as the sow
lies on the inclined surface. As the figure shows, the sty is part of a s
shed. It is 9ft. 1 in. by 6ft. 3 in., and is sufficient for four fattening
The front abutting on the passage consists of a pivoting trough 4 feet
with an iron railing over it, and a door 2ft. 2 in. wide. The cost of buil
such a sty is moderate.

Watering Place on Moor Pastures. — HEISIG, I. in *Zeitschrift für Moorkultur ud Torfverwertung*, Year XI, Part 3, pp. 87-93. Vienna, 1913.

In preparing the plan for a moor pasture the question of providing the ng stock with a permanent supply of good fresh water is one of irst to be considered, and it may be solved by means of the springs that arise on moors, by brooks or ponds or neighbouring lakes or by the r collected in the drainage ditches, the best way being always by a ient supply of running water.

If in a drainage scheme the main drainage ditch which collects also the r which formerly flowed through the moor as a small brook, traverses

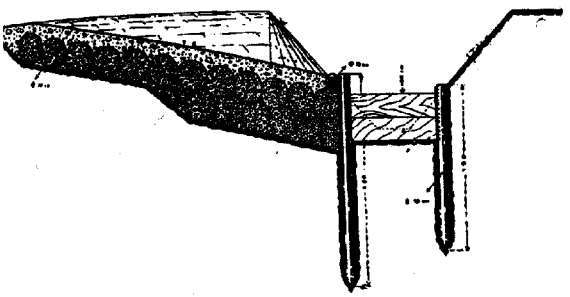


Fig. 1. — Section of watering place on secondary ditch.

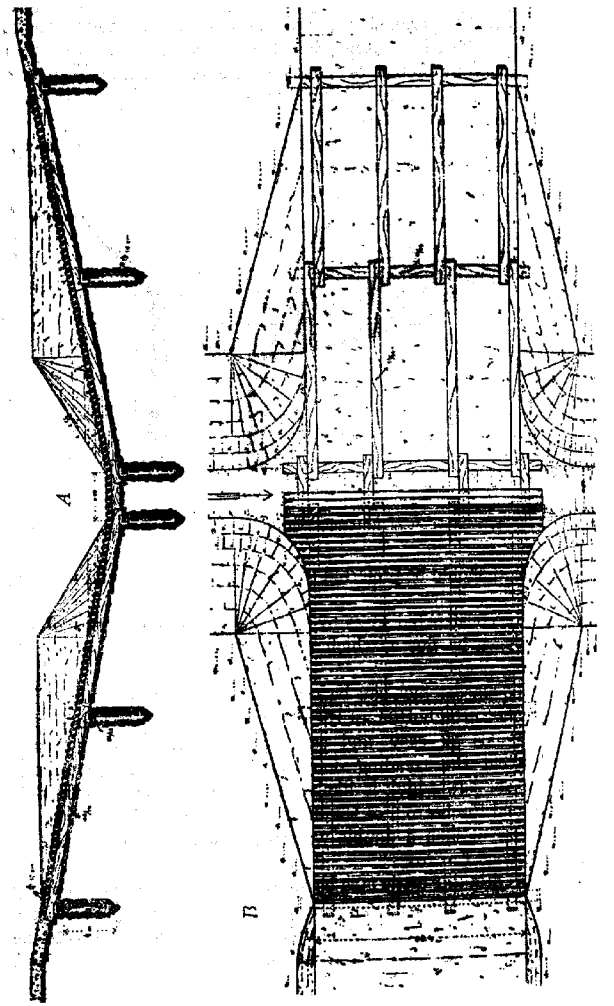
moor pasture, it should be preferred to any other source for the watering e.

This must be constructed so as to suit the special conditions of the r soil as is shown by fig. 2, which represents the plan and section of ouble watering place.

This watering place, which can be used also as a ford, is about 13 feet . The descents to the bottom of the ditch have a slope of 1 in 5, thus rding the animals an easy and safe access to the running water. order to prevent the treading down of the slope and the animals ring in the moor soil, which is likely there to be especially soft, both approaches and the bottom of the ditch are covered with 4-inch round bers. The cost of such a double watering place, including material l labour, is about £10 10s.

If instead the drinking water is to be obtained from one of the secondary ches which often supply sufficient and good water for the purpose, spe- l arrangements are necessary. A simple, efficient and cheap watering ce is shown in cross section in fig. 1, in which the water is held up by a ll wooden weir (1).

(1) Similar ditch watering places are discussed in *Mitteilungen des Vereins zur Förderder Moorkultur in Deutschen Reiche*. 1911. No. [illegible] 393.


A
B

The cost of such a watering place is relatively low, about £2 10s. If recourse must be had to spring water, a so-called "automatic rer" is recommended; these are, however, not suitable for large herds, which it is more advantageous to pump the water into the drinking ghs. Lastly, the writer mentions the enclosures connected with ering places and the arrangements for preventing the water being ed.

RURAL ECONOMICS.

- **The Distribution of Capital in Fifty Peasant Farms in the Segeberg District in Schleswig-Holstein.** — HINRICHS in *Mitteilungen der Deutschen Landwirtschafts Gesellschaft*, Year XXVIII, Part 33, pp. 512-517. Berlin, September 13, 1913.

The writer discusses in this paper the results of his investigations on the ribution of capital in 50 peasant farms in which the inventory of the ts was made at the same time (New Years' Day 1913) acording to the ns for peasant farms published by the Deutsche Landwirtschafts ellschaft under the name of "Vermögens nachweis für bäuerliche riebe". He gives some data on the climatic, economic and soil conons of the district which are necessary for rightly judging the distrition of capital.

In most of the farms a light sandy soil prevails, only 13 disposing of ood loam. The very limited extension of hoed crops, the prevalence of eals, the introduction of two or three years' grazing and of buckwheat aracteristic of the locality) into the rotation, as well as the still customary e fallows, point to an extensive cultivation which does not require much ulating capital. The average extent of the farms examined is about 126 es, of which an average of 86.2 per cent. is arable, 8 per cent. meadow, d 5.8 per cent. permanent pasture.

Of the total fixed capital, 75.2 per cent. represents the bare land, 0.4 r cent. the land improvements and 0.9 per cent. the woods; while the value the buildings amounts to 23.5 per cent. This ratio between land and buildgs may be considered as fairly favourable. In some farms, however, the io is notably different. The greatest capital in buildings is 42.9 per cent. the capital in land, the smallest only 11.8 per cent. On every acre of proctive land there is an average capital of £10 3s 10*d* in buildings; in some ms this sinks to £3 19s 4*d* and in others it exceeds £20.

The total working capital per acre of productive area is £10 1s 10*d*, which sum the cash in hand is not included. Of the above sum £6 16s resents the live stock, £1 10s 11*d* the dead stock and £1 14s 11*d* the plements. This working capital, which is rather small for modern ditions of farming, is an index of only a medium intensity of farming.

Of the total capital, the fixed capital is 81.4 per cent. (land 62.6, ldings 18.8) and working capital 18.6 per cent. The working capital is further bdivided as follows: live stock 67.6 per cent., machines and implements

15.2, and dead stock in kind 17.2. The ratio of percentage of these thr kinds of capital to the total capital is 12.7, 2.7 and 3.2 .

The value of cattle is 59.6 per cent. (cows 41.9, other cattle 17.7) of t whole capital in live stock, thus revealing the importance of the dairy these farms. Horses represent 20.6, pigs 19.6, and sheep 0.2 per cent. the capital in live stock.

The capital in machines and implements is, in general, not high. O of the whole inventory capital only 18 per cent. is the share of the dead stoc as against 82 per cent. of the live stock.

The ratio between the circulating capital and the fixed working capit is as 1 : 4.8. Although the cash in hand could not be included in t account, it may be said generally that in a good many cases the peasa farmers work with too small a circulating capital. Still, a sure and defini opinion on the economic suitableness of the distribution of capital in indiv dual farms cannot be pronounced without the aid of careful book-keepin

1288 – **The Cost of Big Farming.** — SHOCKNEY, DON P. in *The Country Gentlem* Vol. 78, No. 37, pp. 1321-1322. Philadelphia, September 13, 1913.

The large farm owner in the South of the United States with the gener system of renting in shares and with the present average crops about bushels of maize or half a bale of cotton to the acre, gets no profit at a but only losses. He rents his land in lots of 20 acres to each negro tena family, who plant 14 acres to cotton and 6 to maize. The planter furnishe

Twenty acres of land worth $5 a year	100.00
Overseeing	60—
Mule, its feed and care	150—
Use of implements and harness	20—
House rent	24—
Fuel privileges	12—
Pasturage for cows, pigs and ponies	24—
Maintenance and overhead costs	40—
Cotton seed	20—
Seed corn	2—
One half ginning, bagging and ties	9—
Planter's cost, one half interest in 20-acre crop or $23.05 per acre	$461—

The negro tenant furnishes:

	$
161 days common labour, cotton	161.00
21 days » » , maize	21—
One half ginning, bagging and ties	9—
Tenant's cost, one half interest in 20-acre crop	$191—

The average returns are in normal years:

7 bales of cotton, 525 lbs. each, at 11 cents a pound	404.25
3 ½ tons cotton seed at $ 20 a ton	70.00
120 bushels corn, at 70 cents a bushel	84.00
product. 20 acres	$558.25
Value [illegible] net per a[illegible]	$27.91

Cost per acre and per annum.

	Long staple cotton	Short staple cotton	Early corn cut and shredded	Late corn slip shucked	Oats and cow-peas two crops
	$	$	$	$	$
ring tilling, and carting . .	10.30	10.30	10.67	9.31	8.05
dding fodder			4.00		
shing oats					2.00
, cow-peas					2.50
ng hay or straw , ...					7.50
shredded fodder , . . .			4.00		
ning cotton, short staple . .		1.50			
, » long staple . .	2.00				
d labor, hoeing	3.00	3.00			
» shocking maize . .			1.00		0.50
» » oats , .					
king cotton, short staple . .		5.40			
» » long staple . .	6.00				
cking corn.				1.25	
ton bagging and ties . . .	0.45	0.54			
ndling	0.10	0.12	1.00	0.50	1.00
d	2.00	1.00	0.50	0.50	2.50
rseeing	3.00	3.00	1.80	1.50	1.50
intenance, fences, ditches, oads and buildings	2.00	2.00	2.00	2.00	2.00
erhead-taxes, insurance and neral expenses	2.00	2.00	2.00	2.00	2.00
Total cost per acre . . . $	30.85	28.86	26.97	16.96	20.55

The planter gets one half of this product, $ 13.95 per acre, and suffers as a direct loss of $ 23.05 - 13.95 = $ 9.10 per acre.

According to the writer no farmer or corporation of farmers could succeed in inducing negro tenants to increase [illegible]r-acre yield to a point where the landlord's share would show a profit [illegible]nd above [illegible]pense.

Plantations are exhausted by the continuous cotton growing, and t yields can only be increased by giving the land regular doses of humus a nitrogen, and these can only be produced by establishing a regular rotati and a live stock industry. But this is impossible with the present distri bution of the land into small lots to the share farmers. Evidently th a farming corporation, if it wants to work at a profit, must give up t share system and have recourse to the wage system.

As a good and paying rotation the writer suggests the followin 1st year: long or short staple cotton; 2nd year: early or late main 3rd year: fall oats followed by cowpeas in June. He then calculates, the basis of one dollar a day, average wages for common field work, and o dollar a day for the cost of mule work, the cost of the above crops per ac (see Table).

The average outlay per acre per annum that the planter would ha to pay would be somewhat higher than under the half-share system, b in exchange he would get the whole of considerably increased crops, that his farming would be much more profitable.

1289 – **The Cost of Wheat-farming in Victoria.** — RICHARDSON, A. E. V. in *Pastoral Review*, Vol. XXIII, No. 8, pp. 785-786. Melbourne, August 15, 1913.

The cost o growing wheat varies considerably in different parts the State. It is lowest in the Mallee district and highest in the north-ea and Goulburn Valley where the soils are extremely difficult to work

Allowing 2*s* 6*d* for a horse and 7*s* for a man per day, the average co of the various operations is as follows:

	Per acre		
	s d		*s d*
Ploughing	6 9	to	8 0
Three harrowings	2 3	"	2 3
Three scarifyings or cultivations	6 0	"	7 6
Drilling	2 0	"	2 0
Seed	3 0	"	4 0
Superphosphate	2 6	"	3 9

Since two-fifths of the wheat is sown on fallow land, interest on th land lying idle for nine to twelve months should be reckoned in the cost cultivation of the wheat.

Harvesting is generally done by means of a harvester or a stripper a winnower and the cost comes to about 3*s* 9*d* per acre, with 2*s* or 3*s* extra the cost of the bags according to the size of the crop. The cost of carta to the station averages about 2*s* per acre, stacking at the station 1*d* per ba loading on trucks ½*d* per bag, store charges ¼*d* per bushel, and stevedo ing 1*s* 6*d* per ton, or ½*d* per bushel.

The average haulage of wheat for Victoria in the season 1910-11 w 174 miles, at a cost of 10*s* [illegible]on, or 3.49*d* per bushel; since January last year the [illegible] has been reduced to 9*s* 9*d* per ton, or 3.16*d* per bush

) - **The Profitableness of keeping Productive Stock,** on the basis of the results of 32 farms affiliated to the Book-keeping Office of the German Agricultural Association (Deutsche Landwirtschafts Gesellschaft), during the year 1912-1913. — GUTKNECHT, in *Mitteilungen der Deutschen Landwirtschafts Gesellschaft*, Year XXVIII, Part 35, pp. 493-498; Part 36, pp. 507-510. Berlin, August 30 and September 6, 1913.

The researches upon the profitableness of keeping productive live stock lly lead to contradictory results and to erroneous opinions when they are ed on the bare figures furnished by the yearly balancing of the ledger hout considering the special character of the individual farms. The merly usual method of investigation, namely by direct calculation, is ter adapted to give a correct idea of the connexion between net profit l the keeping of productive live stock, by the fact that it seeks the ses of profit or loss.

The writer consequently adopts this method in the present investi- ion and describes the system followed in his calculation, which comprises the *Debit*:

1. The value of the stock as per inventory.
2. The outlay for the purchase of stock, for veterinary assistance, and sundries as per cash book.
3. The forage as per crop book.
4. The value of the increase of stock, from the stock account.
5. The amount of labour spent upon the live stock, from the stock count.
6. From the general accounts the share of the cost of management, keep of buildings and implements and insurance.

On the *Credit* side:

The value of the live stock at the end of the year, to which are added figures of the amounts received for animals sold, those of the animals their produce taken by the owner or his household, and those of the ad passed to other branches of stock breeding.

In a table which contains all the figures exerting any influence on the ult, the profitableness (Rentabilität) is calculated for the individual ms, which, according to their geographical position and to their kind of ming, are divided into several groups. Of 22 farms only six show a profit their milk cattle accounts; to obtain the net profit from these the erest of the capital invested in milch-cattle and in stabling should be tracted. The average profit amounts to 2 ½ *d* per head and per day, maximum being 5.2 *d* and the minimum 0.63 *d*; the loss on the other 16 ms amounts on the average to 3.3 *d*, the maximum being 8.32 *d*, and the nimum 0.68*d*. Of six farms about which only the total result of the keep- of productive stock could be calculated, three showed a loss (2.35 - 6 - 5.365 *d*) and three a profit (1.03 - 0.62 - 3.07 *d*), while of the seven farms which the results of fattening cattle could be calculated separately, four sed their accounts with profit (an average of 1.8 *d* per head and per y) and three with loss (average of 3.98 *d*).

The writer then discusses the result and its causes for each farm and this basis draws some general c[illegible]ns. The [illegible]able result

obtained in the majority of cases, notwithstanding the fact that the intere of the capital invested in stock and in stabling has not been calculated the expenses, obliges one to recognise that with the present state of agr cultural science and technique the necessity arises of giving up, com pletely or partially, the keeping of productive stock.

This verdict, however, is subject to some modification if it be considere that in the above calculations the prices of farmyard manure and of certa fodders (such as pasture grass and other green foods such as beet leave have been fixed without sufficiently considering that they were for war that cannot be sold in the market; the result is that the manure is value low and the fodders too high. The former was estimated on the bas of the prices which the plant foods are paid in artificials, and without takin into consideration that it can be replaced by lime, green manuring and fa low. The unsaleable fodders were estimated at schematic purchase price without giving due weight to the special conditions of the farms; while wit but few exceptions, the live stock is to be debited only with the effectiv cost of the pasture and of the green fodder and with the manurial value o the residues of the hoed crops used as fodder. It can therefore be considere that in reality the giving up of live stock would mean for many farms a di minution of net returns. This question can consequently only be resolve case by case according to the individual conditions of the farms as to cli mate, geological and economic condition, the losses on the trade in live stock the special kind of farming, the division of labour and the capacity of th manager of the farm.

The keeping of live stock can be considered as an independent branc of farming which buys and sells at market prices only where actual marke prices exist for all the products, as for instance in the neighbourhood of larg towns. In every other case the great changes that would be caused to th whole of the farm by giving up the keeping of productive stock have t be considered. Only after having valued the unsaleable products of th soil from this point of view is it possible to ascertain by direct calcul tion the profitableness of keeping productive stock.

1291 – **Profitableness of Fattening Cattle in Illinois.** — KIDDER, R. L., A Cati Feeding Experience. — *The Breeder's Gazette*, Vol. 64, No. 10, p. 397. Chicago, Se tember 3, 1913.

The writer bought on August 1, 1912, at the Kansas City market, head of cattle weighing 24 300 lbs. They cost $ 5.65 per cwt. The com mission was $12, the writer's railway fare and expenses were $ 20, freig and feed bill $ 37.22; total cost $ 1 440.

The cattle were put on good timber blue-grass pasture till October 1 when they weighed 27 600 lbs., having gained in the 83 days 110 lbs. eac The animals were then put on a 14-acre stubble-field and fed snapped co and oat straw, and what they could get out of the stubble. The corn a hay rations were increased gradually, until by Thanksgiving (about the e of November) they were on full feed. They were now again weighed, a their weight was found with [illegible] or water all night) was only 27 440 l

Until near Xmas the cattle were fed in the open; afterwards they were n into the feedlot and sheds. From January 1, 1913, they received / about ½ lb. of 50 per cent. alfalfa molasses feed, shucked corn being ially substituted for the snapped corn, and hay and straw being fed ecreasing quantities. On January 16, the total weight of the cattle 30 760 lbs. About this time, cottonseed meal was added gradually ie ration till the amount per head per day reached 2 lbs. in the last fort-t.

On March 25 they were shipped to Chicago. They weighed 1 161 lbs. he station of departure, and 1 128 lbs. on reaching Chicago, where they hed $ 8.30 per cwt.

The total expenses incurred were as follows:

Price of cattle	$	1 440.00
Corn, 1800 bushels at 43 cents	»	774.00
Cottonseed meal at $ 37 per ton	»	28.25
Molasses feed	»	26.25
Pasture	»	120.00
Salt	»	2.50
Hay, 3 tons at $ 12 per ton	»	36.00
Straw, 2 tons at $ 4 per ton	»	8.00
Interest on investment, at 6 per cent	»	58.00
Depreciation on bunks	»	7.00
Total	$	2 500.00

If the cost of wages is set against the price fetched by manure and fat-ed hogs, the net outlay was $ 2 740, and the clear profit was $ 240, or 3 per head.

AGRICULTURAL INDUSTRIES.

12 - **Investigations into the Solubility of Milk Proteins.** — LINDET, L. M. in *L'Industrie Laitière*, Year 38, No. 34, pp. 543-547; No. 35, pp. 557-561. Paris, August 24 and 31, 1913.

This article is a summary of numerous investigations into the solubility the casein and albumens present in milk. The writer is of opinion that he coagulation of milk, a large quantity of casein, as well as albumen, es over into the serum. The two serum proteins behave nearly alike egards solubility in the serum elements, the formation of precipitate, property of coagulation and of attaching themselves to the coagulated in. The only notable difference is in the rotation angle, which is 30° he case of the albumen and 116° in that of the casein.

With the addition to the milk of lime or phosphatic salts, a decrease es place in the solubility of both albu[illegible]d casein alike. The cause of is probably a decrease in the solven[illegible]t in the leaf.

The following is a summary of the results of the experiments:

1. A difference exists between the soluble proteins and the decomp sition products of casein in milk; the latter dissolve in such large quan ties in milk that they are easily demonstrated in the serum elements.

2. From its solubility in the serum on the addition of calcium chlori its power of attachment to the coagulated casein, and its coagulation high temperatures, there is every reason to consider the albumen a case Albumen should be known therefore as casein β, to distinguish it from t other form, casein α, which is always present in larger quantities.

3. The total amount of soluble albumen and casein in milk is alwa nearly constant, but the amount of each present is very variable.

4. The soluble albumen and casein adhere by capillarity to the su pended casein and are more concentrated in the micellae of the latter tha in the serum.

1293 – **On the Defect Known as "Knypers" in Edam Cheese.** (1) — Boekho and Ott De Vries in *Centralblatt für Bakteriologie, Parasitenkunde und Infektionskra heiten*, Vol. 28, Part 4-5, pp. 108-111; Vol. 38, Part 19-20, pp. 462-484. Jena, S tember 20, 1910, and August 9, 1913.

This defect in the cheese is characterized by one or more large crac running obliquely across it and dividing it up into separate portions. On the rind, as a rule, remains intact and holds the cheese together. The d fect makes its appearance when the cheeses are from 12 to 14 days old, a can be detected by the full tone they give on tapping and the sinking of the rind where the cracks occur. The latter are full of gas-bubbles co sisting of varying proportions of CO_2, H and N.

The writer has ascertained by means of many isolation experimen and the examination of a large number of cheeses that the defect is due to virulent, anaerobic, butyric-acid producing bacterium, with an optimu temperature of about 22°C., which produces spores, especially when cul vated on gelatine, and is absent from normal Edam cheese. This micro-o ganism can be rendered innocuous by the addition to the milk of 0.01 p cent. of potassium nitrate. If the milk is rich in ordinary Coli bacter the writer advises the use of a slightly stronger solution. The article co tains an account of the experiments and illustrations of cheeses affected Knypers disease.

1294 – **Grecian Wines.** — Chassiotis (Director of Agriculture, Athens) in *La agricole et rurale*, Year 2, No. 40, pp. 350-352. Paris, September 6, 1913.

Grecian wines may be classified as follows: dark red, dry white, comm red, liqueur and dessert wines.

1. *Dark red wines.* — They are chiefly used in blending and are ported either as they are or mixed with thin wines. They contain co derable amounts of extract and tannic and astringent matter, and th percentage of alcohol is about 10° to 15° Gay-Lussac. The following wi belong to this class: Coumis (Euboea) 10-11.5°; Leucadia, Saint-Ma

5-13°; Corfu 12-13.8°; Paros and Antiparos 11.5-12°; Nemea (Corinth) 14°; Santorin 12-15°; Acarnania 12-13°; Cephalonia 13.5-15°; Volos 10-12°.

2. *Dry white table wines.* — Most of these wines are used for local consumption as rosined wines (1), made by adding 2 to 5 per cent. of pine resin to the must before fermentation. Those exported are not subjected to this process. The most important white wines are from Calchis, Aliveria (Eubœa) 11-12°; Salamina and Aegina (Attica) 12-13.5°; Elis and Arcadia 12-14°; the plateaus of Tripolitza and Mantinia (Arcadia) 8-10°.

3. *Common red wines.* — Some of these wines are consumed locally and the rest exported. They are dry, slightly sweet and contain a high percentage of alcohol. The most important districts are Xirochovi (Eubœa); Paros, Zea (Archipelago), the Ionian Islands; Cephalonia, which produces; a wine (Mavrodaphne) resembling Malmsey, 13-14°; Santorin 13-15°; Corinth, Achaia, Patras, Pyrgos, Calamata 11.5-12°. At Rapsani, Thessaly, near the Olympian mountains, a wine is produced of a beautiful ruby colour, slightly tart, with a fine bouquet, 11-12°. The wines of Tricala Karditsa, in Acarnania, generally possess strength and fineness, but often lacking in freshness.

4. *Liqueur and dessert wines.* — These are generally white wines, sometimes with a light golden tint. Their strength is almost always natural. Whenever alcohol is added only the rectified alcohol of wine is used. They are found chiefly in the islands, such as Cephalonia (muscat wine) and Santorin (vino santo).

Generally the Greek cultivator only makes a portion of his harvest into wine for his own consumption and sells the remainder in the form of must to retail wine merchants, and hotel and restaurant keepers, who make their own wines. These generally buy at about 10 frs. per hectolitre (¼ *d* per gallon) and retail the wine at 40 to 50c. the litre (1s 5*d* to 1s 8*d* per gal.) Large establishments making wine for export are few in Greece.

During the last 20 years the exports of wine and must, sent chiefly to Italy, Germany, Austria, England, France and America have been as follows:

Average of the periods:	Hectolitres
1896–1900	240 000
1901–1905	210 000
1906–1909	280 000
1910	639 000
1911	612 759

One hectolitre = 22 gallons.

The exportation is less than one-tenth of the total production of the country; it has increased a little during the past three years owing to the

(1) See No. 1262, R. Anvil 1911.

use of fresh currants following upon the various measures of fore countries against the wines of dried grapes.

The crisis in the wine trade which now prevails in Greece is due chie to the disturbance in the raisin industry, to the enormous emigration, whi has depleted the country of some 200 000 peasants, representing a surp of 400 000 hectolitres, and to the increasing popularity of beer shops place of taverns. An other important factor is the great irregular in the quality of the wines produced from one year to another, due part to the ignorance of modern methods of wine-making. The followi measures can be adopted for developing the industry: the popularisi of better methods of wine-making, formation of co-operative cellars, rect dealings with the consumers, and exemption from duties.

Raisins. — The spread of phylloxera in France resulted in a rapid velopment in the production of raisins in Greece, until in 1905 it had reach the total of 150 000 to 170 000 tons from an area of 190 000 acres; abo the same quantity is produced at the present time. In 1889 France alo took 70 000 tons of raisins for wine-making, but by 1892, owing to reconst tution, the demand had fallen off, and the addition of a duty caused intense crisis in Greece; the excess supply soon reached 30 000 to 50 0 tons, so that the price fell from 200 frs. to 30 frs. the 1 000 lbs. To d with this crisis, the Bank of Athens founded in 1905 a privileged socie for encouraging the production of and trade in currants. This Socie levies an export duty of 7 frs. per 1000 lbs, and withdraws from the mark into its warehouses a certain quantity of the year's production (20 to per cent). It also takes for storage any quantity of raisins or currants t producers wish to deposit; if the grower does not withdraw them, the ciety takes them over at a price varying between 115 and 140 frs. per 10 lbs. according to the quality. The society has not the right of exportati of any of the produce it has obtained, but can only make use of it for loc consumption or various industrial purposes. It has also to pay a duty the State (amounting to 4 ½ million francs) on the dried grapes passi through its hands, and to spend a fixed sum on advertising in other cou tries. Further, the society must grant growers who wish to grub th vineyards an indemnity of 800 to 1 000 frs. per hectare (£13 to £16 per acr The quantity of dried grapes generally retained by the society is abo 50 000 tons per annum, the greater part of which is consumed by seconda societies in the manufacture of alcohol for strengthening liqueur wines, for industrial purposes.

Since the foundation of the Society the extreme prices have been 1 and 200 frs. per 1000 lbs., and the average selling price is at present abo 140 frs. As a result of advertising, the foreign consumption has also creased. Thus the average consumption of the United Kingdom has ris from 55 000 tons in 1900-05 to 61 000 tons for 1906-11.

PLANT DISEASES

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN.

- Calcareous Chlorosis of Green Plants. The Part Played by Root Excretions in Absorbing Iron from Calcareous Soils (1). — MAZÉ, P., RUOT, M. and LEMOIGNE, M. in *Comptes rendus hebdomadaires des Séances de l'Académie des Sciences*, 1913, 2nd Half-year, Vol. 157, No. 12 (September 22, 1913), pp. 495-498. Paris, 1913.

The writers have shown that the chlorosis attributed to the presence the soil of an excess of lime is due to the fact that the iron is rendered luble by the calcium carbonate (2); they also add that those plants ch have thus suffered from a deficiency in iron must be incapable issolving its oxides through the absence of free mineral and organic acids heir root excretions.

	I gms.	II** gms.	III gms.	IV gms.	V
m nitrate	1.—	0.5	0.5	0.5	The same as I diluted to one half.
sium phosphate (*)	0.25	—	—	0.25	
ium sulphate	0.2	—	0.1	0.2	
sium sulphate	0.05	0.25	0.2	0.1	
us sulphate	0.025	0.005	0.025	0.025	
m chloride	0.1	—	0.1	0.1	
sium silicate	0.025	—	—	0.025	
inium sulphate	0.025	—	—	—	
anese chloride	0.025	—	0.025	0.025	
chloride	traces	—	—	traces	
g water	1000	1000	1000	1000	
sium sulphate	—	0.25	0.2	—	
am sulphate	—	0.25	—	—	
loc phosphate	—	0.25	0.5	—	
m chloride	—	0.25	—	—	

* Reduced nearly to neutrality to phenolphthalein by the addition of potash.
** This is the solution used by E. Lambert for cultures of peas.

(1) See No. 1206, *B.* Oct. 1913.
(2) See No. 1462, *B.* Oct. 1912.

This conclusion is supported by a series of experiments summari in this note.

The researches were carried out on *Vicia narbonensis* (1) and the Ca tacus pea. These plants were grown in an aseptic medium, with soluti of different compositions. *Vicia narbonensis* was cultivated in solut I, and the peas in solutions II, III, IV and V of the accompanying tal

With the addition of 2 per cent. of calcium carbonate, all these soluti evoked intense chlorosis in the *Vicia* and the peas; the disease also appea in the peas growing in the control solutions without calcium carbonate. T course of the disease was identical with that followed by the writers in 19

It was shown by using some drops of a 0.1 per thousand solution ferric nitrate that the decoloration was certainly again due to want of in Half the affected plants were then divided into two lots, and a few c of one of the following solutions, *a* and *b*, were introduced into their nut tive solutions.

Solution *a*		Solution *b*	
	gm.		gr.
Seignette salt	0.1	Sodium citrate	0.1
Tartaric acid.	0.01	Citric acid	0.0
Distilled water	1000	Distilled water	100

The object of the organic acids is to dissolve small quantities of iron the presence of calcium carbonate, and to allow the roots to take the up from the solution.

When this treatment was carried out, the affected plants became gre in the sun in the course of two or three days according to the clearness the sky. The *Vicia* plants gradually resumed the normal green of the contr which did not show the slightest trace of discoloration ; they resumed the activity, while the chlorotic plants which had not been treated lost the leaves and died.

The existence of the disease is signalised in the case of the roots by pink coloration of the nutritive solution; the roots themselves assum an ochreous tint. The very slight acidification of the media by the additi of solution *a* or *b* caused the gradual disappearance of the pinkish tin and the rootlets which grew subsequently were as white as those of t controls.

The peas gave the same results with a delay varying according to nature of the solution in the case of the controls. The pink coloration the nutritive solution was correlative with the evolution of the disea disappearing on treatment as in the case of *Vicia*.

The general occurrence of the disease, even in the absence of calci carbonate, is explained by the large amount of soluble calcium in the so

(1) [illegible] resembling the field bean. (Ed.)

The absorbed calcium is in part eliminated by the roots in the form of arbonate; thus the iron fails to come into solution exactly where it t to be absorbed.

Treatment with acid solutions has caused diseased plants to ne green again, even when more discoloured than the cholorotic *Vicia* s, but the cure was not in every case effected by one treatment, the obstimate cases requiring a second, more energetic treatment.

Of the four solutions used for growing the peas, III proved the best in ding the appearance of the disease.

The two acid solutions added for the solution of the iron were equally icious.

The writers have therefore succeeded in producing at will the occur- e of calcareous chlorosis in plants, which, under natural conditions stand fairly large doses of calcium carbonate; but the presence of sol- calcium salts and the addition of calcium carbonate place the plants r the conditions obtaining in the case of a waterlogged chalky soil hich all the insoluble components would be encrusted with lime.

The introduction into the solution of small qualities of free organic s brings into solution minute quantities of iron and causes the disap- ance of chlorosis.

The resistant plants act in the same manner; and if American vines me chlorotic in calcareous soils, this is because their root excretions are sufficiently acid. This does not mean that the acidity of their sap ss than that of the resistant plants, but proves that the decomposition he organic acids — the food of the plant — is more complete in the roots pecies susceptible to chlorosis.

A soluble ferric compound, in the presence of calcium carbonate, will ays conquer the disease, provided at the same time it is able to re- chemical or microbiochemical destructive agents, a condition of affairs h it is difficult to obtain.

The best preventive treatment therefore consists in washing over the and the ends of the pruned canes with a solution of iron sulphate. remedy ferric nitrate is preferable. A solution of this compound 2 per thousand sprayed onto the leaves is absorbed in a few hours, never fails to produce rapid results.

Iron sulphate is most suitable for leguminous plants which have need lphur, since deficiency in the latter substance, as has already been shown fazé (1), also occasions intense chlorosis.

- **The Unfavourable Effect Produced by Various Fungicides, Insecticides and Insectifuges upon the Germination of Vine Pollen.** - GARINO-CANINA, E. Influence des traitements sur la germination du pollen des vignes. - *Annales de la Science Agronomique française et étrangère*, Year 30, No. 2, pp. 113-130, figs. I-X. Paris, August 1913.

The writer set himself the task of determining whether the fungicides, cticides and insectifuges most commonly applied to the vine at the time

(1) See No. 223, *B.* Jan. 1912.

of flowering have any influence upon the normal germination of its pol a subject concerning which there were no data either from practical perience or laboratory work.

As the subject of the experiment, the very readily germinating po of Aramon × Rupestris Ganzin No. 1 was selected; the material came fr vines under glass. This pollen, when dried on blotting paper, almost c pletely preserved its germinating property.

The chemicals used were as follows: cupro-ammoniacal solut copper sulphate, copper acetate, potassium arsenate, lead arsenite, l acetate, mercuric chloride, barium chloride, potassium permangan calcium hydrate, potassium sulphide, sulphur, sulphurous acid (1), ac acid, phenol, nicotine, pyridine, soap, nicotine soap.

After several attempts, the writer found that Strasburger's solut (15 per cent. saccharose and 1.5 per cent. gelatine in distilled water) was medium most suited to the rapid development of the pollen grain, and b adapted for the observation of its growth (especially if this solution w slightly acidified with sulphuric acid). He therefore used this compos as a control, adding to it, in turn, for purposes of experiment, varying p portions of the above-mentioned substances.

He thereby discovered that the latter exercise a more or less to action upon the germination of pollen grains; some entirely prevented g mination (cupro-ammoniacal solution, copper sulphate, sulphur dioxi lead acetate, copper acetate, potassium arsenate, lead arsenite, mercu chloride, calcium hydrate, phenol, soft soap); others (powdered sulph barium chloride, potassium sulphide, potassium permanganate, acetic ac nicotine, pyridine) retarded germination and caused degeneration of t pollen grain. It was further found that cupro-ammoniacal solution strong than 0.05 per cent. hindered germination, the limit of concentration the case of copper sulphate being also about 0.05 per cent.

Copper and other heavy metals kill the protoplasm. Pollen which h first been placed for 6 hours in a 0.75 per cent. solution of copper sulpha then put in a filter and washed with distilled water until all the free co per was removed, was observed and compared with pollen which had be left in distilled water for the same space of time. The latter pollen grai alone germinated; those which had been submitted to the action of the su phate remained inert in spite of the washing. Further, contrary to t generally-received opinion according to which the first sulphuring control of powdery mildew is favourable to fertilization, the writer foun the course of his experiments *in vitro* that sulphur exercises a retar action upon pollen germination. This is explained by the produc of sulphurous acid, which is toxic to the pollen as well as to most m organisms. The writer intends to verify the toxic action of sulphur sprea upon the flower by means of closer and practical experiment.

In another experiment he used pollen from three different Europ

, all in flower at the same time: Black Alicante, considered by growers vine with pollen of strong fertilizing property; Alexandrian muscat, of h the fertilization is often irregular; and Bicane, with an agglomerate n occurring in very thick masses and considered barren. The culture of three pollens in the control solution with the addition in turn of copper iate, potassium arsenate, soft soap, precipitated sulphur and sulphur de, gave the same order of results as those already obtained for ion × Rupestris Ganzin No. 1. It is notable that the Bicane pollen, placed in the control medium, which was very favourable to the ination of the other pollens, showed no results, thus confirming the vations made by the vine-growers. Observed dry, Bicane pollen clearly distinguishable by its shape from the other dry pollens ined. The writer proposes repeating his experiments on the flowers, der to ascertain whether the above-mentioned compounds have an lly poisonous effect upon the ovary.

BACTERIAL AND FUNGOID DISEASES.

– **The Influence exerted by Fumagine upon the Assimilation and Respiration of the Host Plants.** — NICOLAS, G. in *Revue générale de Botanique*, Vol. XXV, No. 297, pp. 385-396. Paris, September 15, 1913.

It is generally held that the fumagine fungi which cover the branches particularly the leaves of certain plants with a more or less thick black ng are injurious chiefly because they hinder assimilation and respira- This idea was not based on any precise observations, so the writer rtook experiments to test its accuracy.

Leaves covered with fumagine were divided in two, one half being freed the fungus; the two halves, or symmetrical portions of them, were duced into tubes containing air with 8 to 10 per cent. of carbon di- and saturated with moisture. The apparatus of Bonnier and Mangin ised for the analysis of the gases, and in each case two determinations made.

From thirteen experiments with *Nerium Oleander* L., *Citrus Aurantium lea europea* L., *Psidium aromaticum* Aubl., *Gardenia Thunbergia* L. f., *dia tenax* Wild. and *Sciadophyllum ellipticum* Blume, it is clear that gine hinders both assimilation and respiration. The retardation of processes depends on the thickness and density of the fungus coating.

– **Some New or Rare Plant Parasites in Italy.** — MONTEMARTINI, L. Alcune alattie nuove o rare, osservate dal Laboratorio di Patologia vegetale di Milano.— *ivista di Patologia vegetale*, Year VI, No. 7, pp. 204-210. Pavia, September 1913.

Diseased cucumbers from the neighbourhood of Milan were found to ttacked by *Cladosporium cucumerinum* Ell. et Arth. (*C. Cucumeris* k); the disease had been noticed for two or three years, but it was ill 1913 that serious damage was ca[illegible] some gardens 05 per cent. e crop was lost. The fungus was all[illegible]Cordel[illegible]d Ger-

many, but not as doing damage; in the United States, however, it has long been known as a serious pest

Septoria Iridis Massalongo was found as an undoubted parasite on yo leaves of *Iris* in Rome; it had been recorded by Massalongo only on with ing leaves of *I. germanica*. The spores were larger than those described Massalongo.

Botrytis vulgaris is recorded on camelias in a cold greenhouse at Pa

Cladosporium Pisi Cug. et Macch. is recorded on a white-seeded Fre bean at Pavia; this is a new host, peas and broad beans being the ones p viously known.

The writer records three cases of parasitism on "occasional hosts The first is *Fumago vagans* Pers., which spread from an oak to neighbouri brambles, blackthorns and elms. The others refer to *Cuscuta*: *C. E thymum* Murr. was found to spread onto *Galium verticillatum* and *Pl tago media* from clover, and *C. europaea* onto grasses from nettles.

1299 – **Tomato Rot.** — PAVARINO, L. in *Rivista di Patologia Vegetale*, Year VI, No pp. 161-163. Pavia, August 1913.

The micro-organism *Phytobacter lycopersicum* n. sp., isolated by Groen wege (1) in Holland in 1913 from tomatoes attacked by rot, presents the sa morphological and cultural characters as *Bacterium Briosii*, which h already been isolated by the writer (2) in 1910 from material collect in Italy.

As only *Bacterium* and *Bacillus* are now recognised as genera of ba teria, the latter name must stand.

1300 – ***Gloeosporium Darlingtoniae*** **Parasitic on** ***Darlingtonia cal fornica*****, an Ornamental Plant.** — KLEBAHN, H. Beiträge zur Kenntnis der Fu imperfecti, II. — *Mycologisches Centralblatt*, Vol. III, Part 3, pp. 97-115, figs. 16 Jena, September 1913.

The specimens of *Darlingtonia californica* Torr. growing in the Botan Gardens at Hamburg were attacked during the course of the summer 1904 by a disease characterised externally by the green tissues turnin brown, and which destroyed several plants in a short space of time. Micro scopic examination having revealed the presence of mycelium in the di coloured tissue, and of conidia on the surface of the affected portions, seemed probable that a fungus was the source of the trouble. Infectio experiments carried out in September 1905 gave positive results. Wishin to repeat these experiments during the autumn of 1912, the writer scarce found two affected plants; the fungus developed late, infection was light an the disease spread little. Perhaps this was attributable to the advance period of the year at which the experiments were carried out, but it i equally possible that between 1905 and 1912 the fungus had become le virulent or the host plant more resistant.

After giving the results of anatomical investigation upon a portion of material which had been artificially infected, and of his observations pure cultures of the fungus, the writer states that the parasite of *ingtonia* already entitled by Potebnia *Discula Darlingtoniae* is a new es of *Gloeosporium*, to which he has given the name of *G. Darling-*. The writer discusses the question of the value of Von Thümen's *lla Darlingtoniae*, which seems to be based on a fungus occurring on other tree.

The writer describes in another chapter a *Pestalozzia* which he found, ell as the *Gloeosporium*, on the dead portions of diseased plants of *Dar-nia californica*. In microtome sections, another conidial form was d together with the *Pestalozzia*. It is unlikely that this belongs to the lopment cycle of the *Pestalozzia*, so that it may be connected with sporium *Darlingtoniae*.

Pestalozzia must be regarded as essentially saprophytic. The infection riments on *Darlingtonia* always gave negative results. In pure cul-, free conidia were not obtained at first, but there occurred upon a na a great development of fructiferous bodies (true pycnidia), which ained the characteristic *Pestalozzia* conidia. On continuing the re-ches, the formation of free conidia on the substratum was subsquently ined.

The appearance in the cultures of true pycnidia, and especially the fact the fructiferous bodies which are formed under natural conditions upon substratum are true pycnidia with a pseudoparenchymatous invest-t, shows that the genus *Pestalozzia* is wrongly placed among the *Melan-aceae*. It would be better referred to the *Sphaeropsideae* (*Sphaeri-ae, Phaeophragmiae*), and placed near the genus *Hendersonia*. The *alozzia* found on the *Darlingtonia* belongs to the morphological type of *ersicolor* Spegazz., but owing to some of its characters, a special place been assigned to it.

- **The Results of the Control of the American Gooseberry Mildew *(Sphaero-theca mors-uvae)* in Russia.** — De Jaczewski, A. Quelques mots sur le raitement de *Sphaerotheca mors-uvae*. — *La Revue de Phytopathologie appliquée*, Vol. I, No. 6-7, pp. 87-88. Paris, August 20-September 5, 1913.

In Russia, this disease began to attack the gooseberry bushes at the be-ing of the century, but it appears that the fungus was introduced America into the Southern provinces towards 1890. The Institute of topathology at St. Petersburg has devised the following system of con- which is based on a long and varied series of experiments (1), and is efficacious if properly carried out:

1. — In autumn, when the leaves fall, the ground round the bushes ld be thoroughly dug over, in order to bury as deeply as possible the leaves and the berries bearing the mycelium and perithecia of the is.

1) See No. 2021, *B*, June 1911; No. 722, *B*.

2. — The branches, and the soil beneath the bushes, must be w sprayed with a solution of sulphate of iron (30 gms. per litre, or 3 lbs. in gallons).

3. — In spring, before the buds break, the bushes should be pru by removing all thickly-growing branches which hinder the penetration light and air; care being taken to prop up any branches which touch t ground; after this, the spraying should be repeated as in autumn.

4. — As soon as the young leaves have made their appear spraying must be begun; the best compounds for this purpose wi mentioned later. If the treatment is preventive, three or four sprayin 15 or 18 days' interval are all that is required; but if the disease bec rife, as it has done in Russia, much more frequent spraying (every 10 c days) is necessary until the berries turn colour; after the gooseberries gathered, it is well to spray once or twice more; the young shoots espec should be treated, as at this time they are most liable to be attacke the fungus.

As for the fungicides for summer spraying, a Bordeaux mixture or 2 per cent. (1) and copper salts in general, have merely a preventive eff Before the appearance of the disease, it is possible by means of very ca spraying with copper salts to arrest the development of the parasite, b the fungus is fully developed, Bordeaux mixture has no effect, very fi because the thick felt of the oidium does not permit of the penetration the copper salt. Only one compound with a copper base has been fo equal to the sprays to be mentioned: this is azurine (copper sulph and ammonia) at 3 gms. per litre (3 lbs. in 100 gallons); it has gi excellent results, without scorching or harming the leaves, but its pric relatively high.

On the other hand, the experiments made at the Institute have sho that sulphur (2) usually brings about the fall of almost all the leaves. I the same reason, mixtures of sulphur and quicklime are not suitable to t case in question; 1 per cent., and even ½ per cent., lime-sulphur washes bring off most of the leaves. Amongst the other sulphur compounds, th which have given the best results practically everywhere in Russia duri the last few years are alkaline polysulphides; it is true that they cause so leaf-fall, but by using only 2 or 3 gms. per litre (2 or 3 lbs. per 100 gallon and spraying only in the evening or early morning, as well as by accusto ing the leaves to sulphur when they are quite young, the damage due scorching and leaf-fall can be avoided. The susceptibility to injury fr these sprays varies according to the varieties, and certain hardy ones not at all affected by the application of polysulphides.

M. Doroguine, the Assistant at the Institute, has for nearly two y been occupied in testing various alkaline compounds. He has found t

(1) See p. 163, *B.* Nov. 1910; p. 856. *B.* May 1912. (E.A.)

(2) See p. [illegible] Nov. 19[illegible] (E.A.)

[illegible] 884, *B.* July 1913. (E.A.)

ıary commercial soda (3 gms. per litre, or 3 lbs. per 100 gallons) is no efficacious than polysulphides and azurine, and costs much less. The defect of this solution is that it does not adhere sufficiently to the leaves is easily washed off by rain, which necessitates spraying at frequent vals, in the case of a severe attack every 8 or 10 days. To obviate this ulty, however, it is only necessary to add to every 2 or 3 gallons a lful of flour, or a spoonful of treacle. Perhaps great adhesive power ı more easily be obtained with soap emulsion, or the addition of gelatine. tic potash in the same proportions seems to have an effect similar to of soda.

Sphaerotheca mors-uvae often attacks currants, particularly black, in ia; but it seems that, as in the case of the *Uredineae*, there are biolo- races of the parasite, since in plantations consisting of different spe- of *Ribes*, one is attacked, while the others are immune. Varieties of same species also differ in their predisposition to the disease.

– **Bacteria isolated from European and American Vines Affected by "Bramble-leaf".** — FAVARINO, L. Ricerche sul Roncet. — ID. Ulteriori ricerche ul Roncet. — *Rivista di Patologia Vegetale*, Year VI, No. 6 (August 1913), pp. 164-170 and No. 7 (September 1913), pp. 193-203. Pavia, 1913.

The writer has been occupied in investigating the abundant material ived from Sicily and other parts of Italy in order to ascertain whether bacterial or fungoid parasite exists, which, by its constant presence, ls any support to the opinion of those investigators (Viala, Briosi, Pichi, acroix and others) who consider "bramble-leaf" ("roncet" in French) rasitic disease.

He introduced portions of diseased vines (stems, branches and shoots) different nutritive media, after having previously carefully disinfected ı, and obtained the development, in cultures which were originally ; of some micro-organisms mostly of a bacillus type; he describes their phological and cultural characters.

From a specimen of Rupestris du Lot affected with typical "bramble- ", received from Palermo, three micro-organisms were isolated; one ıed identical with *Bacillus Baccarini* Macch. (*B. vitivorus* Bacc.) and ıe cause of the vine disease known in Italy as the "mal nero". He isolated a fourth micro-organism from other specimens of Rupestris Lot from Noto (Sicily). The Rupestris from the nurseries at Vittoria ly) alone produced no pure cultures, owing to their remaining contam- ed. Finally, from young wild plants of Riparia × Rupestris sent Voghera (Prov. of Pavia), two micro-organisms of similar character, therefore to be referred to the same species, were obtained. No cul- s were obtained from rooted shoots on which Barbera was grafted, also from Voghera.

In the case of *Bacillus Baccarinii*, it must be assumed, until proof is d to the contrary, that it can, under certain conditions, also become cause of "bramble-leaf", if this dis[illegible] which is difficult to identify, nsidered to be a form of "mal nero" [illegible] more or [illegible] Leaf [illegible] toms

according to the resistance of the vine. It may be that these bacteria a saprophytes, which, under exceptional circumstances, become path genic. According to the researches of Meissner, Zahn, Hausen, Buchne Lehmann and others, the healthy tissues of animals and plants do not co tain bacteria capable of development. It may, however, be a question non-pathogenic organisms occurring at the same time as the "active parasite, or subsequently to the latter, as is suggested by the last research of E. F. Smith. In any case, only experiments on artificial infection, whi will be made in the course of time, can determine the "bramble-leaf micro-organisms and decide whether those with which we have just dea are among them, and whether in addition to the specific and active mic organism, other non-pathogenic species occur at the same time.

1303 – ***Bacillus Vitis*, a new Schizomycete, Parasitic on American Vine Liguria.** — MONTEMARTINI, L. Un nuovo Schizomicete della vite. — *Rivista di P logia Vegetale*, Year VI, No. 6, pp. 171-176. Pavia, August 1913.

The Government Nursery of American vines at Ventimiglia (Ligu was established about twenty years ago near the river Roia upon a pebb light and arid subsoil; it is irrigated intermittently and badly manured w the sweepings of the town. Five years ago, some vines growing there w in a serious condition which increased with time, and ended in the dea of the plants. The disease spread, and destroyed a large part of the n sery. The Rupestris were the most affected; the Aramon × Rupest also suffered, while the various Riparia hybrids proved immune.

During the first years of the attack, special cultural operations we carried out round the diseased vines, the latter being plentifully manur The vines which were substituted for the diseased plants were able to gro and scions grafted on shoots taken from the diseased vines have done w up to the present. The distribution of the disease in the nursery has always been irregular. The diseased vines occur chiefly in the interior the plots; those on the outside having more air and light appear to be st healthy.

At first, the disease presented the characters of a general weakeni of the vegetative growth of the plants (production of small feeble shoo with the formation of suckers). It is only of late years that the most se ously affected vines have showed symptoms of "bramble-leaf".

The writer observed in the case of the withering vines which he lected and studied in 1911, that transverse sections of the vine wood largest roots showed blackish patches of irregular shape and distribut occurring singly or together in a section, with indefinite boundaries, varying in diameter from some millimeters to half a centimeter. The ex ence of these patches, and the fact that in the same places the vessels w obstructed by tyloses, or by masses of viscous substance, aroused the sus cion of the presence of a gummosis of bacillus origin, and caused the wri to search the wood of the infected vines for some definite micro-organis The bacillus which had been isolated in 1911, was again isolated in 19 by Prof. P[illegible] from th[illegible] of other vines (also from the green pa from[illegible]y in a[illegible] advanced stage of the disease.

The fact of having found this bacillus after an interval of two years, upon a certain number of plants, and that it possessed constant morlogical and cultural characters, makes it probable that this micro-organis of some importance in the etiology of the disease, and led the writer, n giving a complete description of the bacillus, to propose for it the visional name of *Bacillus Vitis*. The latter differs as much from *B. carinii* Macch. (*B. vitivorus* Bacc.), found in the wood of vines suffer- from "mal nero", as from the forms of Schizomycetes isolated by Naso n vines affected by the same disease. Neither has it been possible to ntify it with any of the polymorphic, and sometimes entirely saprotic, micro-organisms occurring so frequently upon plants. Only inoation experiments can decide if *B. Vitis* is really pathogenic, and the se of the destruction of the vines in the nursery. For the moment, all t can be said is that the above-described disease presents the phenoon of rachitis accompanied (either as primary or secondary cause) by alteration of the wood, with the formation of gum and the presence of a cial Schizomycete. This "rachitism" is very similar to "brambleſ", so that it is possible that the disease commonly known by the latter ne is not an affection always due to the same cause, but is rather a symp- n attributable to a variety of agencies (parasitic, climatic or edaphic).

4 - **The "Rote Brenner" (*Pseudopeziza tracheiphila*) of the Vine.** (1) MÜLLER-THURGAU, HERMANN. Der rote Brenner des Weinstockes. II. Theil. — *Centralblatt für Bakteriologie, Parasitenkunde u. Infektionskrankheiten*, Part II, Vol. 38, Nos. 21-25, pp. 586-621, 1 plate. Jena, September 20, 1913.

In an article in the same journal for 1903 the writer stated that *Pseudoia tracheiphila* was the cause of this vine disease, which had formerly n attributed to atmospheric agency. As some investigators still denied parasitic nature of the affection, Hr. Müller-Thurgau carried out further earches which confirmed those he had previously made. He succeeded growing the fungus upon vine leaves killed artificially; he also observed manner in which it passes the winter upon the fallen leaves of the preus year; and he has been able to reproduce the disease on living leaves. infection depends upon the age and the water content of the leaves.

The writer recommends for the control of the parasite, the improvent of the physical constitution of the soil and of the state of nutrition the plants, the planting of resistant vines, and spraying the young leaves h Bordeaux mixture, etc

5 - **Two Fungi as Causal Agents in Gummosis of Lemon Trees in California (*Botrytis vulgaris* and *Pythiacystis citrophthora*).** — FAWCETT, H. S. In *The Monthly Bulletin of State Commission of Horticulture*, Vol. II, No. 8, pp. 601-617 + 12 figs. Sacramento, California, August 1913.

The term "gummosis" expresses the result of the disease rather than actual disease itself. It is characterised by dying areas of bark accomhied by exudation of gum. It has been shown to be due to the presence

(1) See also No. 877, *B.* July 1913.

of one or other of two fungi, commonly known in packing houses as brow rot fungus (*Pythiacystis citrophthora*) and grey fungus (*Botrytis vulgari* respectively.

Various physiological explanations have been given for this disea owing to the failure of attempts to induce it by inoculation. Later expe ments have shown that inoculation is successful only when the disea material is obtained from the advancing edges of diseased areas. The t sues already permeated with gum in the diseased areas always failed induce the disease when transplanted to healthy bark. The two typ of the disease are as follows:

1. Grey Fungus (*Botrytis vulgaris*). — In attacks of this fungus t outer layer of bark is killed much in advance of the inner, in which th is some softening of the bark. Pure cultures of this fungus were obtair and successful inoculations produced. In bad attacks of the fungus moist weather, raised cushion-like patches of grey spore-covered bod appeared on the surface. It was found that neats-foot oil applied to i inoculated wounds encouraged the fungus and exaggerated its effects.

2. Brown Rot (*Pythiacystis citrophthora*). — This is the most comm form of gummosis. The bark remains hard from the beginning and is kil slowly through to the wood without any evidence of fungus growth. P cultures were obtained and the fungus proved to be the cause of this fo of gummosis. Neats-foot oil appeared to be without effect on this fo of the disease.

The brown rot fungus is known to live in the soil, and this explains w flooding the trunk of the tree or burying the bud union below the soil favourable to the development of the disease. Young trees are more resist to the disease than old ones and inoculations on various citrus t have shown that the lemon is most susceptible, the sweet orange next sour orange least of all. This explains why sour orange trees are least s ject to attacks of gummosis under unfavourable orchard conditions, also why lemons cannot be well grown on their own roots in California

Treatment. — Bordeaux paste has been found most effective, mad follows: 1 lb. blue stone (copper sulphate) disolved in 1 gallon of water wooden vessel; 2 lbs. of uns aked lime, slaked in about ½ gallon of wa Stir together when cool and apply with a brush. It should always be fresh. Cutting out the diseased bark is necessary before applying the p and care should be taken to remove the edges of the diseased area. (may exude after applying the paste, indicating that infested bark e outside the treated area. If the infected area is considerable it may be desirable to isolate it by removing strips of bark only and applying the to the edges to prevent spreading of the disease.

INSECT PESTS.

- **The Froghopper Egg Parasite (*Oligosita giraulti* Crawford) and its Colonisation in the Cane Fields.** — URICH, F. W. in *Board of Agriculture, Trinidad and Tobago, Circular* No. 11, pp. 5-9. Port-of Spain, Trinidad, August 18, 1913.

This parasite on the eggs of froghoppers in cane fields has been rmined by Crawford as *Oligosita giraulti*. It has been bred from the s from numerous sugar cane estates.

Life History. — It is an extremely active insect and runs over dead and grass leaves very rapidly. It locates the eggs of froghoppers in l tissues and after a thorough examination lays its eggs inside them. Oviposition takes from 4 to 30 minutes according to the state of the A certain stage in the development of the froghopper egg is found to ore favourable to the development of the parasite. This was found xperiment to be when the hatching-lid of the froghopper egg was well ed and black in colour. The parasite failed to develop on the eggs of host if they were young or newly laid. The period of development he parasite to the perfect insect is from 22 to 41 days.

During the development of the embryo the normal froghopper egg re- is quite white ; but when parasitized it changes colour after 5 to 7 days, ming grey and then quite black. In such eggs the red coloration ie parasite can be made out a day or two before emergence by viewing egg by transmitted light.

The adult parasite measures about 0.5 mm. and appears to be always hing for froghopper eggs, passing from one piece of grass to another hort leaps. Up to the present no males have been observed, and fe- s kept in confinement reproduce parthenogenetically with an average offspring.

Since the eggs of the host require more moisture for development the parasite, it is possible for two generations of the latter to attack ame batch of froghopper eggs, and as a female parasite is ready to lay eggs within an hour after emergence, the multiplication of the opper is seriously checked. The percentage of parasitism works out bout 16 to 25.

With a view to increasing the extent of this parasitism, the artificial ding of the parasites and their liberation in the cane fields has been mmended. This method is rather slow and it is found to be much expedient to transfer cartloads of the grass infested with parasites he cane fields. By this method it is hoped that colonies of the site may be established in the cane fields and the froghopper kept eck.

- **A Billbug Injurious to Small Grain: *Sphenophorus discolor.*** — SMITH, H. S. in *The Monthly Bulletin of State Commission of Horticulture*, Vol. II, No. 8, pp. 619-621, figs. Sacramento, California, August 1913.

Species of *Sphenophorus* have been [illegible] to attack corn (maize) and r cane and become serious pests in s[illegible]ts of the Leaf[illegible]s, but

were not recorded as attacking small grain in California until quite recentl when considerable damage was being done to the experimental plots wheat, barley and oats. The beetles attack the stem of the ears and sev it within the sheath. The ear turns white and fails to develop grains. N larvae or purpae have been observed yet and it is thought that this inse has bred from the growth of tule or bullrush (*Scirpus lacustris*), from whi this land has been but recently reclaimed. Careful destruction of the rushes is therefore recommended in reclaiming this type of land.

1308 – **Larvae of *Gortyna ochracea* and *Vanessa (Pyrameis)* Card attacking Artichokes in France.** (1) — BOURILLY, A. Note sur deux lépidoptè des artichauts. — *Journal d'Agriculture pratique*, 1913, Vol. II, No. 38, pp. 373-3 Paris, September 18, 1913. — TSCHAËN, E. La Noctuelle de l'Artichaut (Gort *ochracea* Hübner). — *La Revue de Phytopathologie appliquée*, Vol. I, No. 3, p. 107-1 fig. 1-2. Paris, September 20, 1913. — VIDAL, E. Deux Ennemis de l'Artichaut. *La Petite Revue Agricole et Horticole*, Year 19, No. 451, p. 211. Antibes, Septe ber 23, 1913.

In the spring of 1913 the artichokes in the neighbourhood of Hyè were severely attacked by the caterpillars of two Lepidoptera.

One of these is *Gortyna ochracea* (" Frosted Orange " moth); Tsch records the examples in question as G. *ochracea* var. *xanthenes* Germ (= var. *cinerea* Gooss ns), while Vidal considers it a distinct species an names it *Hydroecia xanthenes* Germ. All three writers refer to the seriou damage done by these larvae, which bore into the stems and heads, an sometimes also attack the heads from outside.

So far, the most effective treatment appears to be cutting off and burn ing the affected stalks. Tschaën advises burning the whole plant after th crop is gathered, to destroy the larvae and pupae it harbours. As th species attacks many wild plants, Bourilly and Tschaën recommend th clearing away of all weeds near the artichoke beds.

The caterpillars of the Painted Lady (*Pyrameis cardui*) damage th crop by destroying the leaf tissue. Vidal considers that the only go means of dealing with them is to pick off and burn the leaves as they a attacked. All the chrysalides of *Pyrameis cardui* sent to the Natural H tory Museum in Paris during 1913 were found to be parisitized by Chalci of two different genera.

1309 – ***Cladius (Priophorus) padi* attacking Strawberries in France.** VUILLET, A. Un ennemi du fraisier. — *La Revue de Phytopathologie appliquée*, Vol No. 6-7, pp. 97-98. Paris, August 20-September 5, 1913.

In June 1913, two hymenopterous larvae (fam. *Tenthredinidae*), whi had been damaging a strawberry bed, were sent from Bressuire (Deux-S vres) to the Paris Entomological Station. The writer was able to ascert by breeding that they were the larvae of *Cladius* (*Priophorus*) *padi* L., insect of wide distribution in Europe, where it lives at the expense of a lar number of different species of plants. Although it appeared not to ha

n recorded before as occurring on the strawberry, its presence on this it is not surprising, all the more as it has a strong predilection for Ro- ıae (hawthorn, wild rose, pear, plum, etc.). After having briefly des- ed the different stages of development of this insect, the writer mentions ıatural enemies of the larva, *Tryphon lucidulus* Hart. and *Ichneutes ıilor* Nees.

As means of controlling the pest, spraying with nicotine or arsenical ıpounds is to be recommended; care should always be taken to treat lower surface of the leaves. Since strawberries should not be sprayed r the fruits are formed, it is best to apply the preventive treatment ore flowering. When the crop is gathered, it is an easy matter to destroy last generations of the insect.

- ***Serica anthracina* Lee., a Scarabaeid, defoliating Orchards in Cali- rnia.** — Essig, E. O. The Manzanita Serica. — *The Monthly Bulletin of State ımmission of Horticulture*, Vol. II, No. 8, pp. 622-623, + fig. Sacramento, California, ugust 1913.

ın orchard of prune and apple trees in El Dorado County was con- ıbly defoliated during April and May. The writer found this beetle Scarabaeidae) at work and noticed that the attack was worst round oundary of the orchard. He was therefore led to discover the insect d shubbery adjoining. It was found to be particularly abundant on anita (*Arctostaphyllos* sp.) and also occurred on black oak, lupins and *thus* sp. The beetle varies from light brown to almost black in r and is less than half an inch long. Owing to its timidity it is exceed- difficult to find on the leaves.

The remedy recommended consists of: 8 lbs. lead arsenate, 8 lbs. lime ɔ gallons of water. This should be sprayed early and the tender shoots lly drenched with it.

- **The Peruvian Fruit-Fly (*Anastrepha peruviana* N. Sp.).** — Townsend, HARLES H. T., in *The Journal of Economic Entomology*, Vol. 6, No. 4. Concord, N. H., ugust 1913.

The Peruvian coast region has long been known to be infected with the fly, a pest which attacks citrus as well as deciduous fruits, particularly g the month of February.

ın February 1912 a guava tree at Sullana in the Chira valley, Peru, :ompletely infested by Trypetid maggots, and the fly was to be seen ıg the fruits at the same time. The writer reared numbers of these ɔts, and flies were produced from the 4th to the 10th of March. This tree having shed all its diseased fruits during February, produced a ıd crop in March, which contained only one infested fruit containing mall maggot, thus indicating the distinctness of generations.

As the insect does not appear to have been identified before, the wri- escribes it under the name of *Anastrepha peruviana*, and mentions the ıcters which distinguish it from the closely allied species *A. fratercula*. As a remedy he recommends spra[illegible] foliage before the fruits ı to ripen, or as soon as the presence [illegible] flies i[illegible] Leaf [illegible] fol-

lowing mixture : lead arsenate 5 to 10 lbs., chancaca (brown or black ca sugar in cakes) 25 to 50 lbs., and water 100 gallons. The chancaca must dissolved in boiling water before adding to the arsenate solution. Va tion in the amount of arsenate added is required for different kinds foliage, guava and orange standing much more than peach, and the su content should vary in the same proportion.

1312 – **Insects injurious to Olives: *Saissetia oleae* (= *Lecanium olea* *Zeuzera pyrina* (= *Z. aesculi*), *Prays oleaellus*, *Euphyll* *olivina* (= *Psylla oleae*) and *Hylesinus oleiperda*.** — DEL GUE GIACOMO. Nuova contribuzione alla conoscenza dei nemici dell'Olivo. — *Redia*, Vol. Part I, pp. 59-75. Florence, August 28, 1913.

1. — It is well known that the eggs of the black scale of olives (*Saiss* *oleae* = *Lecanium oleae*) hatch out in large numbers from the 10th to the 2 of June, and that quantities of larvae are to be found on the leaves a branches. This period is therefore considered to be the most favoura time for the destruction of the insect. However, in 1912, according the writer's observations in Apulia, hatching of these eggs continued fr the beginning of June until the middle of August, or about 65 to 70 da A fact intimately connected with the preceding is the emission of exc mental liquids ejected to considerable distances by the females of *Saiss* and of juices caused by the repeated punctures of the insects; the quantit of these are responsible for the appearance and spread of fumagine, as t writer has been able to observe experimentally.

Further, the period of activity of the female scales is in agreement w that of the development of the olive fly (*Dacus oleae*), which feeds on t sugary secretions of *Saissetia* and of the no less abundant olive sna (*Euphyllura olivina* = *Psylla oleae*) and infests the olives. The destructi of these insects is therefore necessary on account of the favourable con tions which they produce for the development of *Dacus oleae*. The appe ance and rápid spread of species of *Cicada* and *Cicadetta* or *Tettigia*, whi by the excretion of large quantities of liquid on the surface of the leav produce conditions favourable to the development of the olive fly, wo necessitate similar measures.

2. — In Italy, olives are attacked by the larvae of a Swift moth (*Z* *zera pyrina* = *Z. aesculi*.), known locally as " Rodilegno ", " Tarlo bianc " Tarlo giallo ", on pears and apples ; though very destructive, this has far been neglected ; it attacks a number of trees, including fruit-tre but in Apulia, Calabria, Sicily and Tuscany prefers olives. In Apulia it only found in large numbers on the most improved varieties (known " Ogliarole "), whilst the " Olivastro " and the wild olive are almost i mune ; the same may be said of the Nardò olive, which is also partia resistant to *Dacus oleae*. In this district the larvae of *Zeuzera* often att good-sized branches, provided the bark is still smooth, so that in the weather these dry up and drop all their flowers and fruit ; many such bra ches, however, do not die off at once, but remain as centres of infection several years, producing [illegible] Many labourers in these districts very [illegible] the g[illegible]ght persons may go over 12 000 to 14

in three weeks, collecting 50 to 60 thousand grubs, which are paid for lire (8*s*, or $ 2) per thousand.

Observations by various entomologists on pear trees, have shown that moths lay their eggs during July. The writer has found that in Apulia larvae hardly begin to pupate before the second half of July, while the rity do not do so till the middle of August. Consequently only the st moths appear at the beginning of August, the bulk emerging much For this reason collecting of grubs should not begin before August, should continue till the latest pupae are destroyed.

3. — In the spring of 1912 the olives in the neighbourhood of Serranova lia) flowered with extraordinary vigour, many shoots bearing a thous- or more flowers; but only some thirty to fifty set owing to damage by suckers (*Euphyllura olivina*) and Hyponomeutids (*Prays oleaellus*). On branches only one of these insects occurred, on others both. The damage ided over a considerable area, and amounted to some millions of lire. In the second half of June quantities of *Ageniaspis* emerged from the s pupae, though many were themselves parasitized by an undeter- d microbe within the pupae.

4. — Both in Apulia and in Liguria the writer has observed that the s moths fly away from the olives in June and July, and seek shelter r the thickest, lowest and most shaded leaves of vines, and to a les- it of pears, plums, cherries and figs. By means of dishes containing ned treacle or other liquids, or only water (used in experiments for the rol of the olive fly), it was found that the flight takes place principally e end of June and in the first few days of July. Treacle attracted more than the other liquids, and water hardly at all. The writer be- s that they leave the olives in search of moisture, and in particular of ds on which they can feed.

5. — With regard to the olive-bark borer (*Hylesinus oleiperda*), the gence of the adults seems to take place later than is recorded by Costa; 12 it lasted from just before the middle of May to nearly the middle of ; in 1913 it was the same, and the females were found still wandering he bark as late as July 25.

Experiments showed that this insect will not attack cut twigs, even if are kept fresh, as those confined with such twigs died without egg- g; on twigs attached to the tree, egg-laying was more abundant on le twigs than on those cut back. It is thus evident that healthy trees liable to attack.

6. — It was previously believed that the olives remaining after the dis- earance of the olive suckers were safe; but the writer has observed that are liable to fall in July if situated near parts of the flowering shoot ch have been pierced by the sucker. This explains why flowering ots with twenty or thirty olives on, but only attacked at the base, metimes wither up completely. This "running off" of the young olives s on throughout July, and, according to the writer's 1912 observations, s when the fruits are nearly as big.

ALFREDO RUGGERI, [illegible] *e resi*